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STEEL

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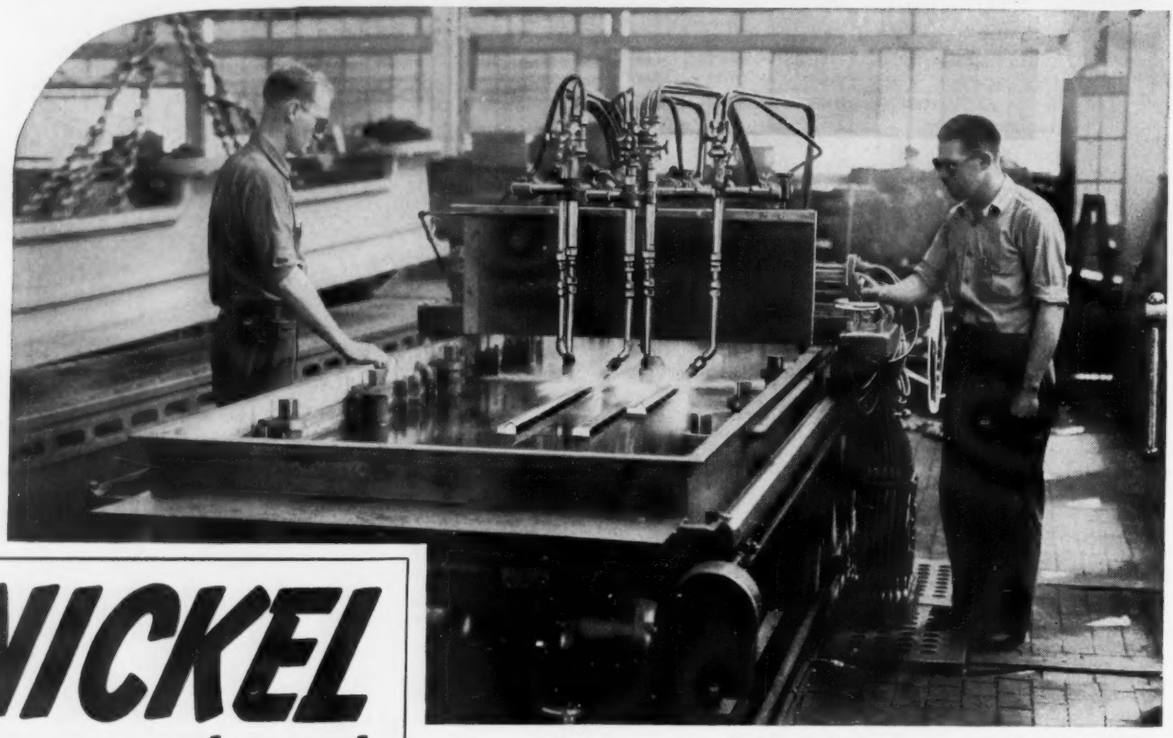
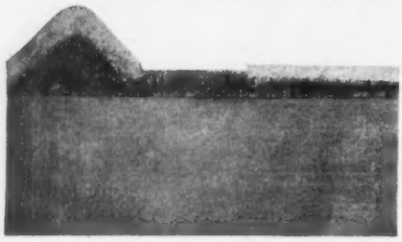
PRODUCTION • PROCESSING • DISTRIBUTION • USE

UNIFORMLY SUCCESSFUL FOR FLAME HARDENING

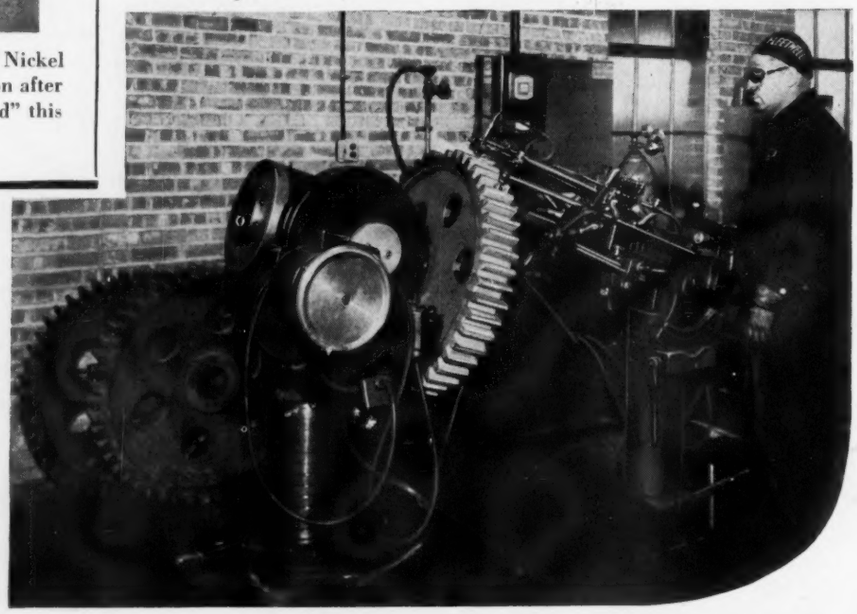


NICKEL
irons and steels



A BROKEN cross-section of a Monarch Nickel cast iron lathe bed shows 1/8" penetration after flame hardening. Nickel tends to "blend" this hardened surface into the core.

NICKEL additions to cast iron tend to condition the metal for flame hardening operations. Here the Monarch Machine Tool Co., Sidney, Ohio, is flame hardening ways used on Monarch lathes. Travelling at 3" to 6" per minute, oxy-acetylene jets pass only once to raise the surface Brinell hardness of this Nickel cast iron from 225/240 to 450/460. Average composition is Total Carbon 3.00, Silicon 1.70, Manganese 0.85, Nickel 1.50, Chromium 0.30%. Monarch states "The use of a carefully controlled nickel alloy cast iron can be depended on to eliminate hard spots and also to stabilize that portion of the carbide in the pearlitic matrix necessary for flame hardening to the fullest degree."



NICKEL alloy steels are especially well adaptable for flame hardening. Photo shows Wesley Steel Treating Co., Milwaukee, simultaneously flame hardening both faces of teeth on a large gear. Cam segments of SAE 3150 Nickel-chromium steel are flame hardened by Wesley to 580 Brinell. For detailed information about Nickel alloyed materials particularly suited for modern heat treating methods, please write to the address below.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

As the Editor Views The News

■ STEEL production last week declined 1 point (p. 27) to 62½ per cent of ingot capacity. Buying reflects some improvement, attributable (p. 85) to reduced steel stocks at consuming plants rather than to a larger volume of consumption. Some gains are reported. Automobile production last week was the highest in seven weeks. Railroad equipment buying is somewhat more active. Electrical refrigerator output is greater. Improved tin plate demand is slated for the near future. Export buying is brisk. These gains are counterbalanced by losses in other directions. With the exception of a decline in prices on concrete reinforcing bars current steel prices are holding up well.

• • •

Steel continues to lag in the struggle for profits. Twenty-one leading steel producers in 1939 (p. 21) reported combined net income of $130,738,551, or approximately 4.2 per cent on total net worth. This compares with 8.4 per cent average return by 960 leading companies in 39 manufacturing industries. The automobile industry in 1939 earned a net profit of 16.5 per cent. . . . First two of a series of "rally for recovery" meetings, under the sponsorship of the National Association of Manufacturers, were held last week at Pittsburgh and Louisville, Ky. They are intended (p. 25) to clarify industrial thinking on current economic problems. . . . Efforts are being made (p. 26) to export American coal.

Steel Lags In Earnings

• • •

A new source of business—the small farmer—is being tapped (p. 28) by the agricultural implement industry; he is giving wide acceptance to the new small tractors and combines. . . . Shortage of certain electric furnace steels (p. 35) is handicapping airplane parts manufacturers who are unable to show government contract numbers; deliveries range from 6 to 14 weeks. . . . Prospects for a federal tax increase this year (p. 32) hinge largely on whether the senate appropriations committee's recommendation of an additional $212,000,000 parity payment to farmers is approved. . . . Government tinkering continues to prevent true recovery, said Mr. Girdler (p. 29) at Boston last week.

Farm Tool Trade Broad

• • •

For mild draws steel should be annealed at lower than 1100 degrees Fahr.; for severe draws (p. 44) the annealing temperature should be between 1650 and 1700 degrees. . . . Most auto trailers (p. 69) now are of all-steel construction. . . . Pure manganese, produced electrolytically, is seen (p. 72) as opening the door to new and unusual alloys. . . . A highly developed routing routine at a machine tool plant (p. 66) aids production and permits close follow-up on progress of work. Departments are placed for shortest sequence of operations. . . . A number of unusual features are incorporated (p. 48) in the American Rolling Mill Co.'s new 72-inch reversing slabbing mill.

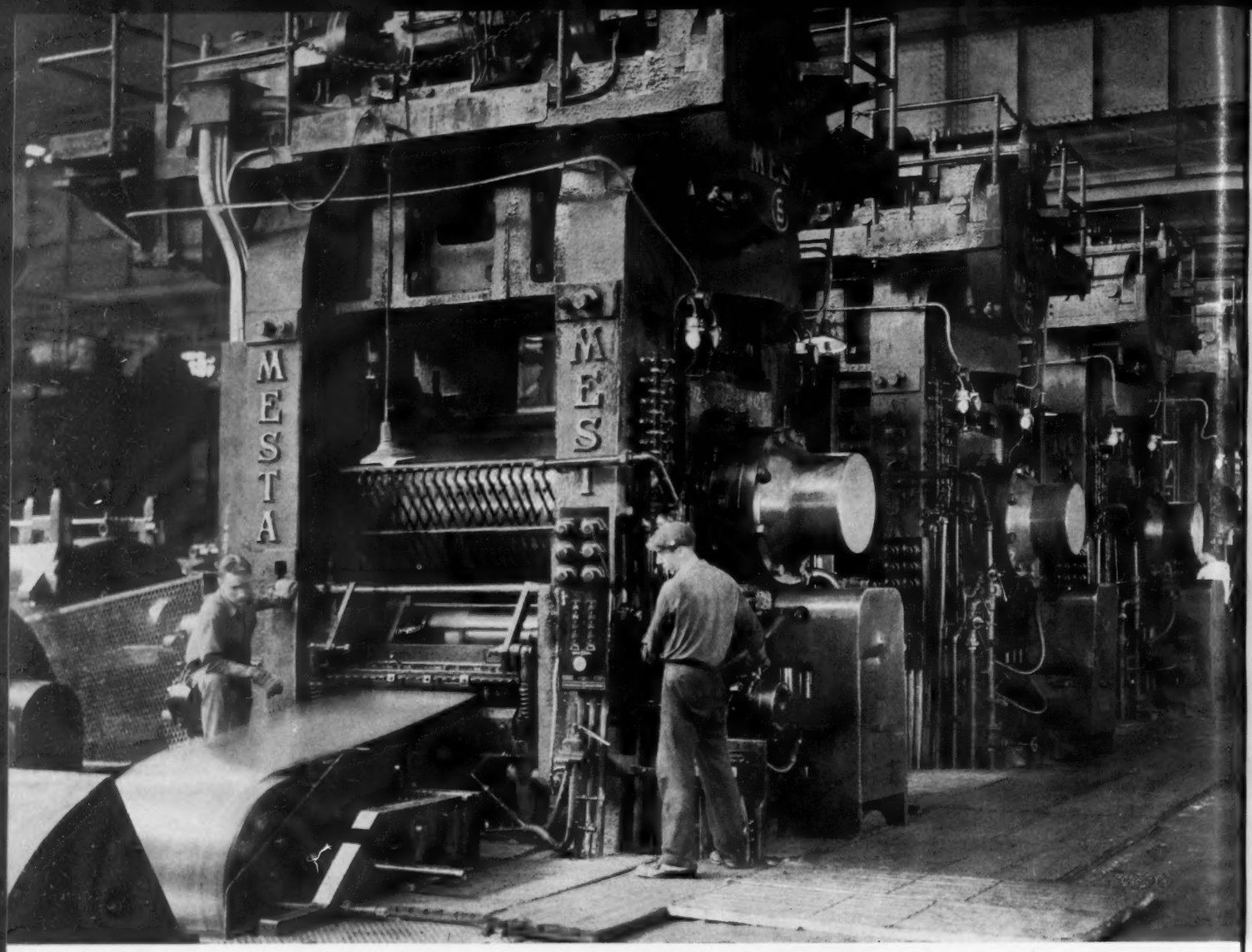
Annealing Temperature

• • •

The tool engineer, vitally important to industry, cannot (p. 50) be a college product. He must be trained by industry. . . . New methods (p. 54) permit economical use of platinum group metals to meet highly corrosive conditions. . . . Holland has made important progress (p. 56) in using high-strength steels in ship construction. . . . Electrostatic air-cleaning apparatus is being installed in a steel mill (p. 72) to protect electrical machinery from dust. . . . Certain molybdenum steels, flame hardened, meet (p. 60) exacting conditions. . . . A re-equipped foundry (p. 64) will produce iron castings by the Randupson process. . . . Wrench manufacturer (p. 69) has a "trade-in" policy.

Use Platinum Economically

E C Kreutzberg



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Steel's 1939 Profits Half Those of Other Manufacturing Industries

■ COMBINED income of 21 leading steel producers last year was $130,738,551, equal to approximately 4.2 per cent on total net worth, estimated at $3,050,413,424 as of Jan. 1, 1940. This compares with average 8.4 per cent return on 1939 net worth for 960 leading manufacturing corporations, representing 39 industries in eight industrial groups.

Increase in steel production during upswing of final months last year made possible profitable 1939 operations, compared to a combined deficit for the same companies year previously. Net profits for the 960 manufacturers last year were up 98.1 per cent, from $646,864,000 in 1938 to $1,281,479,000. Their aggregate net worth last year was $15,181,145,000.

Summary of leading manufacturers' earnings during 1939, prepared by National City Bank of New York, lists but five industries whose percentage return on net worth was lower than the 21 steel producers'; Cotton goods, 2.9 per cent; fertilizer, 2.2 per cent; railway equipment, 2.4 per cent; printing and publishing, 3.9 per cent, and woolen goods, 3.8 per cent.

Ranking high in return on net worth last year were: Automobiles, complete, 16.5 per cent; auto equipment, 14 per cent; aircraft and parts, 15.5 per cent; household equipment, 16.7 per cent; chemicals, 13.8 per cent; silk and rayon, 11.1 per cent; tobacco products, 13.3 per cent; beverages, 15.9 per cent; food products, 7.5 per cent; hardware and tools, 9.2 per cent, and stone, clay and glass products, 9.4 per cent.

Otis Steel Co., Cleveland, has not yet released its 1939 earnings report, is not entered in compilations last year, but is included in earlier tabulations.

Total net 1938 deficit for the identical steel producers, representing 66,621,360 gross tons annual ingot capacity, or about 93.5 per cent of

Leading Steel Producers' Earnings for Past Five Years Compared

	1939	1938	1937	1936	1935	Rated Ingot Capacity
United States Steel Corp.	$41,226,039	$7,717,454*	$94,944,358	$50,583,356	$1,146,708	25,790,000
Bethlehem Steel Corp.	24,638,384	5,250,239	31,819,596	13,901,006	4,291,253	10,240,000
Republic Steel Corp.	10,671,343	7,997,825*	9,044,148	9,586,922	4,455,734	6,500,000
Jones & Laughlin Steel Corp.	3,188,944	5,879,958*	4,788,799	4,129,600	398,715*	3,660,000
National Steel Corp.	12,581,636	6,661,652	17,801,893	12,541,842	11,136,452	3,400,000
Youngstown Sheet & Tube Co.	5,004,484	658,934*	12,190,649	10,564,501	1,641,162	3,120,000
Inland Steel Co.	10,947,251	4,916,203	12,665,317	12,800,545	9,417,818	2,760,000
American Rolling Mill Co.	4,011,909	1,307,880*	8,231,335	6,441,677	4,310,130	2,705,520
Wheeling Steel Corp.	5,560,753	493,138	4,238,488	4,115,388	3,497,626	1,750,000
Colorado Fuel & Iron Corp.	1,649,061	1,683,520*	711,990	2,029,305	225,523	987,000
Crucible Steel Co. of America	2,803,596	2,237,026*	4,017,931	3,120,356	1,268,176	875,000
Otis Steel Co.†		1,230,297*	2,320,031	1,980,149	2,228,664	828,000
Pittsburgh Steel Co.	564,870	488,423*	657,272	265,360*	1,675,353*	809,340
Lukens Steel Co.	83,127	288,505*	158,218	112,205	236,843*	638,000
Allegheny Ludlum Steel Corp.§	2,093,518	1,070,186*	2,934,129	2,870,382	1,789,183	540,500
Sharon Steel Corp.	255,497	95,325*	1,345,810	1,305,852	1,009,154	500,000
Granite City Steel Co.	347,940	330,231*	254,225	288,687	618,358	400,000
Continental Steel Corp.‡	1,208,200	632,865	814,553	736,228	481,978	325,000
Midvale Co.	1,703,771	1,244,210	1,341,816	1,266,168	496,085	268,000
Keystone Steel & Wire Co.	897,299	727,543	1,160,857	1,501,493	1,202,790	250,000
Laclede Steel Co.	210,053	331,849	445,729	240,656	227,351	235,000
Rustless Iron & Steel Corp.	1,090,876	81,110	713,139	350,707	166,133	40,000
Totals	$130,738,551	$10,646,755*	$212 600,283	$140,201,665	$47,299,367	66,621,360

§Year's totals, from 1935 to 1937 inclusive, derived by combining net profits of Allegheny Steel Co. and Ludlum Steel Co.; ‡1935 figures cover June 30, 1934 to June 30, 1935; *Loss; †Not included in 1939 total.

the industry's total, was $10,646,755.

Contrasted to this aggregate deficit in steel earnings, the 960 manufacturers in 1938 had a combined return on net worth of 4.2 per cent.

Net 1937 profit for the same steel producers was $212,600,283, a return of approximately 6.7 per cent on their net worth. Combined net income earned in 1936 was $140,201,665, approximately 8 per cent greater than last year's, and a return of about 4.6 per cent on the same companies' aggregate net worth. In 1935 total net income for the 22 producers was $47,299,367, provided a 1.5 per cent return on net worth.

Average net income on total net worth during past five years was 3.33 per cent. This figure, however, would be much smaller if based on income after dividend requirements had been met.

Recovery in earnings of major industrial groups last year was very uneven. Steel recovered from a net worth deficit of 0.35 per cent in 1938 to a moderate return of 4.2 per cent. Auto equipment manufacturers, with a deficit of nearly 4 per cent on net worth in 1938 rebounded to a profit of 14 per cent.

Automobile manufacturers earned 8 per cent return on net worth in 1938 and 16.5 per cent last year. Chemical industries' profits nearly doubled, from 7.6 per cent to 13.8 per cent last year.

ARMCO EXECUTIVES EXPECT IMPROVED SHEET DEMAND

Improved export and domestic demand for iron and steel sheets this year may be expected to increase operating volume, according to George M. Verity, chairman, and Charles R. Hook, president, American Rolling Mill Co., Middletown, O. In their report to stockholders Mr. Verity and Mr. Hook expressed confidence this year's industrial production would increase greatly if congress would take constructive action on factors affecting business adversely.

Discussing company's export operations, letter states:

"None of the foreign business done by Armco International Corp. and subsidiaries is in direct war materials. Its total monthly volume since Sept. 1, 1939, has shown substantial increase over previous months . . . larger part of which has come from South American market.

"At outbreak of war sales to customers in belligerent and other European nations were put on an irrevocable letter of credit basis."

During the year Armco completed negotiations for participation in long-term leases on Mesabi magnetite ore deposits. Consolidated capital expenditures totaled $7,860,830; major construction program authorized by stockholders in 1937 was completed.

New mill facilities made possible October ingot production of 201,250 tons, an all-time high for the company. Operating rate in 1939 averaged 64.7 per cent, compared to 39.4 per cent in 1938, 72.5 per cent in 1937 and 77.7 per cent in 1936.

Total employment increased from 14,288 in January to a peak of 17,748 in November; 17,583 were employed Dec. 31. Parent company hourly wage employes averaged 36.7 hours per week, compared to 27.2 in previous year and 35.4 in 1937. Consolidated payroll was $30,395,267, an increase of $6,647,538 over 1938 and exceeded but once in the company's history. This was in 1937, when 18,475 were employed at the peak.

Aggregate taxes were $3,046,873, equal to $2.16 per ton of shipments and $196.80 per employe. Total taxes in 1938 were $2,453,506, against $3,441,609 in 1937.

Year	Earnings Per Share on Common	Total Taxes Per Share on Common	Total Taxes Per Ton on Shipments
1935	$2.41	$0.73	$1.06
1936	2.73	1.08	1.61
1937	2.55	1.20	2.30
1938	1.16*	0.86	2.76
1939	0.69	1.06	2.16

*Loss.

Sheet steel prices last year were far from satisfactory, says the report. Due to low prices during period of greatest activity, 1939 net sales income was only 35.4 per cent greater than in 1938, although tonnage shipped increased 58.7 per cent.

Company's 1939 net income was $4,011,909, equal to 69 cents a share on common, after dividend requirements on preferred, compared to net loss of $1,307,880 in previous year. Report states available in-

More Consumers Show Increase in 1939 Net Earnings

■ TOTAL 1939 net earnings of 199 iron and steel consumers aggregated $223,124,651, compared to net profit of $81,958,190 earned by the same companies in 1938. Only 19 reported a net loss for the year, compared to 72 in 1938. Previous tabulations in STEEL, Feb. 19, p. 29; Feb. 26, p. 16; March 4, p. 38 and March 11, p. 18, listed 148 companies; the following includes 51:

	Fourth 1939	Fourth 1938	1939	1938
Aero Supply Mfg. Co., Corry, Pa.	$.....	$.....	$138,501	$109,425
Allied Products Corp., Detroit†	33,012	24,290	209,061	142,793
American Machine & Metals Inc., New York	15,080*	67,545*	134,491*	300,531*
American Radiator & Standard Sanitary Corp., Brooklyn, N. Y.	1,430,470	489,965*	3,712,193	424,077*
American Stove Co., St. Louis†	450,093	108,766*	1,501,848	47,680
Athey Truss Wheel Co., Chicago	.....	.....	132,690	60,935
Bellanca Aircraft Corp., New Castle, Del.	.....	.....	206,262*	172,645
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.†	106,089	24,809*	69,824	191,967*
Bridgeport Machine Co., Wichita, Kans.†	28,703*	1,892*	200,792*	13,184
Brockway Motor Co. Inc., Cortland, N. Y.	.....	.....	212,358	3,347
Bullard Co., Bridgeport, Conn.	.....	.....	286,241	22,171*
Burd Piston Ring Co., Rockford, Ill.	.....	.....	23,262	38,120*
Canada Cycle & Motor Co. Ltd., Weston, Ont.	.....	.....	368,210	325,448
Canada Wire & Cable Co. Ltd., Leaside, Ont.	.....	.....	690,806	462,655
Carrier Corp., Syracuse, N. Y.	.....	.....	69,099§	1,133,021*
Chicago Pneumatic Tool Co., New York†	146,696	195,200	823,587	769,554
Chicago Rivet & Machine Co., Chicago	.....	.....	214,201	31,799
Cincinnati Ball Crank Co., Cincinnati†	4,235*	25,305*	5,032	58,880*
Clark Controller Co., Cleveland	.....	.....	164,459	55,028
Crosley Corp., Cincinnati†	73,427*	128,385	84,949	84,901
Eastern Malleable Iron Co., Naugatuck, Conn.	.....	.....	56,417	319,023*
Easy Washing Machine Corp., Syracuse, N. Y.†	89,704	32,636*	297,765	352,041*
Globe-Wernicke Co., Cincinnati	.....	.....	104,773	13,219
Hajoca Corp., Philadelphia	.....	.....	135,277	108,473*
Harnischfeger Corp., Milwaukee	.....	.....	172,934	335,275*
Holland Furnace Co., Holland, Mich.†	679,681	472,385	1,453,185	1,233,382
Hydraulic Press Mfg. Co., Mt. Gilead, O.	.....	.....	282,703	189,669
Indiana Steel Products Co., Chicago	.....	.....	1,292	23,117*
Jackson Co., Byron, Huntington Park, Calif.†	171,191	92,759	511,747	574,065
Kansas City Structural Steel Co., Kansas City, Kans.	.....	.....	54,133*	143,271
Kelsey-Hayes Wheel Co., Detroit†	380,639	59,207	771,694	903,945*
Lancaster Iron Works Inc., Lancaster, Pa.	.....	.....	63,543*	81,778*
Link-Belt Co., Chicago†	775,623	402,301	1,733,059	1,106,041
Maytag Co., Newton, Iowa	600,312	387,734	1,398,981	682,967
McCord Radiator & Mfg. Co., Detroit	.....	.....	69,036	316,777*
Mesta Machine Co., Pittsburgh	.....	.....	2,715,427	2,909,957
National Malleable & Steel Castings Co., Cleveland†	810,490	181,930*	1,260,670	1,390,504*
National Supply Co., Pittsburgh†	1,390,233	106,786	1,190,787	1,283,767
Simmons Co., New York	1,738,589	1,152,984	2,446,681§	1,644,867
Stanley Works, New Britain, Conn.	.....	.....	2,078,249	971,882
Stewart-Warner Corp., Chicago†	297,015	244,566	553,224	294,323*
Sullivan Machinery Co., Michigan City, Ind.†	194,701	226,611*	69,807	659,047*
Sundstrand Machine Tool Co., Rockford, Ill.	.....	.....	303,858	108,149*
Timken Roller Bearing Co., Canton, O.†	2,378,977	1,046,605	7,287,911	1,427,903
Thompson Products Inc., Cleveland†	293,526	157,689	1,232,199	435,241
United Aircraft Corp., East Hartford, Conn.†	3,576,129	1,861,870	9,375,436	5,426,275
Valley Mould & Iron Corp., Hubbard, O.	.....	.....	846,760	182,291
Veeder-Root Inc., Hartford, Conn.	.....	.....	900,452	553,938
Vento Steel Products Co., Muskegon Heights, Mich.	.....	.....	41,354	8,033
Warren Tool Corp., Warren, O.	.....	.....	23,246	19,525
Weston Electric Instrument Corp., Newark, N. J.†	209,905	70,515	527,201	168,219

*Loss; †fourth quarter statements based on the nine months' and year's statements; §preliminary statement.

come was not sufficient to justify payment of dividend on common, even if existing arrearages on preferred had been paid.

Fourth quarter net income, based on nine months' and year's reports, was $1,741,964, compared to net loss of $27,721 in corresponding 1938 period. Third quarter net income was $600,794.

Balance sheet smmary:

	1939	1938
Net sales	$95,351,230	$70,441,606
Net operating results	3,599,950	1,386,057*
Gross income	6,505,393	316,307
Net income	4,011,909	1,307,880*
Total current assets	52,113,070	49,276,850
Total current liabilities	12,899,053	8,104,746
Total inventories	33,066,624	29,350,553

*Loss.

Earnings comparisons:

Quarters	1939	1938	1937
First	$ 793,479	$ 197,311*	$2,320,816
Second	875,671	525,854*	4,321,955
Third	600,794	556,994*	2,646,525
Fourth	1,741,964	27,721*	1,057,961*
Year	$4,011,908	$1,307,880*	$8,231,335

*Loss.

WHEELING STEEL'S 1939 NET PROFIT LARGEST IN DECADE

Sales of Wheeling Steel Corp., Wheeling, W. Va., last year increased 37 per cent over 1938, totaling $85,716,689 against $62,420,280 in 1938 and $90,455,381 in 1937. Annual stockholders' earnings statement confirms previously reported $5,560,753 net 1939 income, equal to $6.40 a share on common, and highest since 1929, when net profit was $8,005,644. Corporation's net 1938 profit was $493,138; in 1937, $4,238,488.

Cash dividends paid holders of $5 cumulative convertible prior preferred stock during 1939 totaled $5.75 per share. Unpaid cumulative dividends on 6 per cent cumulative preferred, Dec. 31, 1939, aggregated $31.50 a share, totaled $512,946 on shares then outstanding.

Report says $4,673,743 was expended for new manufacturing facilities and improvement of existing units, in addition to expenditures for ordinary maintenance and repairs. Construction program scheduled for immediate future "for additions to plants and for the betterment or improvement of existing facilities which have been deemed necessary to compete with improved methods of steel manufacture" requires approximately $6,000,000 more.

Taxes last year, "more burdensome than ever," totaled $3,202,912, equal to $5.62 a share on common, compared to $3.38 a share in 1938. This was equivalent to $195 per employe against $141 in 1938.

Total payroll was $30,594,677, against $24,117,158 in 1938 and $34,675,273 in 1937.

Belief that present conditions indicate material improvement in sales during next several months was expressed by Alexander Glass, chairman, and William M. Holloway, president.

REPUBLIC STEEL CORP.'S FINANCIAL STATUS BETTER

Net 1939 profit of Republic Steel Corp., Cleveland, was "gratifying only because it was greater than in any other year since the corporation was formed . . . . was less than 5 per cent on money invested." In their annual letter to stockholders, T. M. Girdler, chairman, and R. J. Wysor, president, said common stockholders have had no dividends since 1930, that to end of 1939 aggregate net earnings had not justified full payment of cumulative dividends on preferred.

Pamphlet report confirms previously published net 1939 profit, $10,671,343. Corporation's financial condition, says the report, shows continued improvement. Working capital was brought up to a total of $89,800,954, larger than corporation's total funded debt.

Earned surplus Dec. 31, 1939, was $4,018,546, compared to $2,878,911 earned surplus deficit at beginning of the year. Change resulted principally from addition to earned surplus of last year's net profit and deduction therefrom of $3,861,164 paid in dividends.

Dividends declared during 1939: $4.50 per share on 6 per cent cumulative convertible prior preference stock, series A, paid Nov. 15; $6 per share on 6 per cent cumulative convertible prior preference stock, series A and $7.50 per share on 6 per cent cumulative convertible preferred, paid Dec. 21. Dividends on former constituted payment in full on all accruals to Jan. 1, 1940. Accumulations of $18 per share were accrued and unpaid on the latter Jan. 1, 1940, totaling $2,152,746.

During the year 4,301,667 gross tons of ingots were produced, compared to 2,465,544 in 1938. Volume of business in last quarter was greater than in any previous quarter in the corporation's history.

Average operating rate in 1939 was at 66.2 per cent of capacity, compared with 37.9 per cent in previous year. During the year 3,312,784 net tons of steel products were shipped, against 1,888,519 in 1938; 606,681 gross tons of pig iron were shipped, compared to 254,378 gross tons in previous year.

Balance sheet summary:

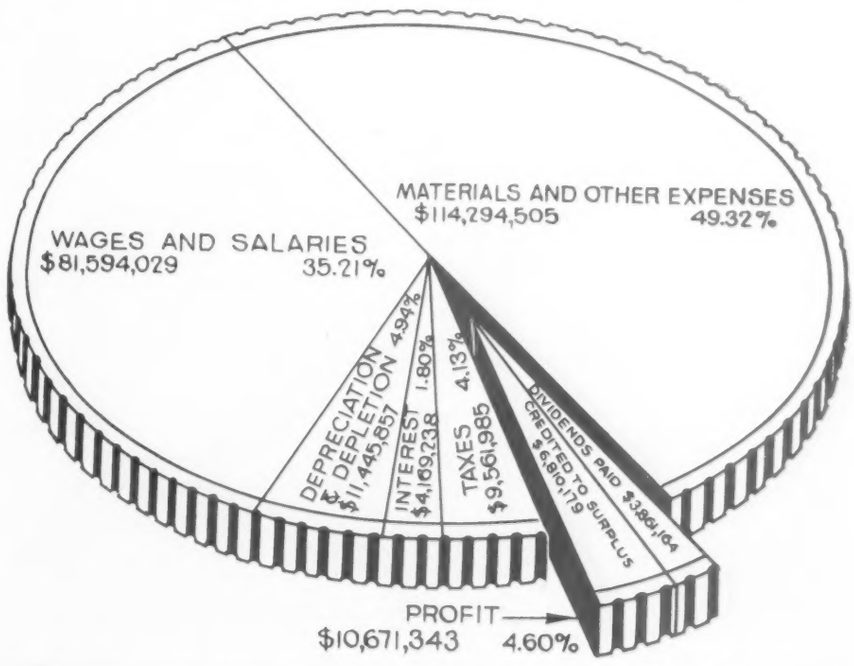
	1939	1938
Net Sales	$230,340,805	$140,879,763
Manufacturing cost of products sold	186,653,800	121,251,323
Gross profit	43,687,005	19,628,440
Current assets	110,255,374	89,566,244
Cash on deposit	15,642,864	16,147,933
Current liabilities	20,454,420	11,437,304
Capital surplus	66,387,346	58,711,282
Inventories	66,177,576	58,070,052
Net income	10,671,343	7,997,825*
Earned per common share	$1.42	$1.78*

*Loss.

ALAN WOOD'S 1939 NET PROFIT REFLECTS SALES INCREASE

Increase in net sales of Alan Wood Steel Co., Conshohocken, Pa., from $9,652,881 in 1938 to $14,744,966 last year was reflected in company's earnings. Net income was $678,921,

(*Please turn to Page* 104)



■ **Disposition of Republic Steel Corp.'s 1939 gross income of $231,736,957: Nearly half went for materials and other expenses; more than 35 per cent for wages and salaries; tax bill was approximately 90 per cent of net earnings, largest last year in any of the company's existence**

Backlogs, War Orders Assure High Operations for Canadian Mills

TORONTO, ONT.

■ CAPACITY operations through the remainder of 1940 at least are assured primary iron and steel producers in Canada by heavy backlogs and the continued placing of substantial war orders. Finance Minister J. L. Ralston has announced the Canadian government will make expenditures at a rate of $1,500,000 a day on war account.

Most secondary plants also are stepping up operations as result of war orders. Meanwhile demand for iron and steel for uses not connected with war orders is showing improvement, with new business widely diversified.

Bell Telephone Co. of Canada Ltd., officials announce that company's construction program for 1940 will involve expenditure of $14,947,000. The program, which covers both new construction and replacements, is about $100,000 greater than that of 1939. Nearly $10,000,000 will be spent for station equipment and exchange lines.

Midland shipyards at Midland, Ont., have been sold to the Kingston Shipbuilding Co., Kingston, Ont. Yards, where some of the largest Great Lakes vessels were constructed, have been idle since 1927. Improvements will be made and the yards used to build antisubmarine vessels and mine-sweepers.

St. John Dry Dock & Shipbuilding Co. Ltd., St. John, N. B., has been awarded contract for construction of three antisubmarine boats, at a cost of $1,900,000. Work on the contract will be started at once. All ships must be completed by November, 1941.

Important large contracts for war materials have just been placed by the British government with Canadian companies. Included in this new business is a large munitions contract, awarded to Canadian Industries Ltd., to supplement previous British orders placed with this company. Part of the order will be handled in the company's explosives plant at Nobel, near Sudbury, Ont., which will be enlarged and new equipment installed.

Canadian Car & Foundry Co. Ltd., Montreal, Que., is reported to have received a substantial British contract for manufacture of shells of large size. This order is said to be of an educational nature and will be followed by others as delivery starts. National Steel Car Corp., Hamilton, Ont., which has been making medium sized shells for the British government for several years, also is said to have received additional orders.

Dominion Foundries & Steel Ltd., Hamilton, has received British orders for production of antiaircraft gun barrels and now is proceeding with erection of addition to its plant to handle this new product.

Contracts placed by the Canadian war supply board during the week totaled $2,736,833. Of the week's awards machinery was the most important item, and the bulk of this business went to United States companies. Machinery contracts were placed as follows: Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., $243,100; E. B. Bliss & Co., Toronto, $179,087; John Robertson Co., Brooklyn, N. Y., $22,668; Ferracute Machine Co., Bridgeton, N. J., $24,962; Williams & Wilson Ltd., Montreal, $17,988; A. R. Williams Machinery Co. Ltd., Toronto, $7253.

Mechanical transport contracts were placed with Ford Motor Co. of Canada Ltd., Windsor, Ont., at $167,575; Kelsey Wheel Co., Windsor, $131,417; Goodyear Tire & Rubber Co. Ltd., Toronto, $65,278; Firestone Tire & Rubber Co. Ltd., Hamilton, $65,143; Dunlop Tire & Rubber Co. Ltd., Toronto, $30,928; McGill & Moore, Hamilton, $16,560 and International Harvester Co. of Canada Ltd., Ottawa, Ont., $5403.

Munitions contracts were awarded to J. E. Lortie Co. Ltd., Montreal at $9654; British war office, $21,000; Canadian Marconi Co., Montreal, $9000; H. W. Cooey Machine & Arms Co. Ltd., Cobourg, Ont., $7842.

Aircraft supplies contracts went to Engineering Products of Canada Ltd., Montreal, at $51,794; British air ministry, $12,552 and Aviation Electric Ltd., Montreal, $6342.

Barracks stores were awarded to Wood Mfg. Co. Ltd., Ottawa, at $169,533; S. S. Holden Ltd., Ottawa, $166,968; J. J. Turner & Sons Ltd., Peterborough, Ont., $46,444 and General Steel Wares Ltd., Ottawa, $7592.

Canadian Steel, Iron Output at High Level

■ Canadian production of steel ingots and castings and pig iron in January exceeded that of December and January, 1939, but ferroalloy output was slightly under the December total. Comparisons follow:

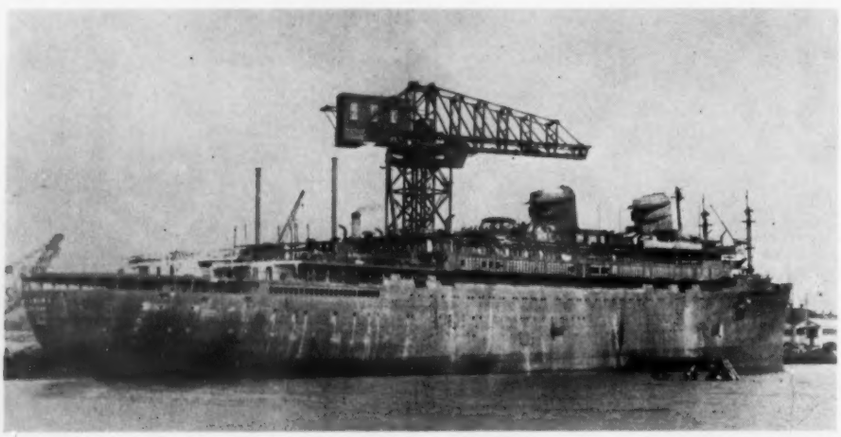
Gross Tons

	Steel ingots, castings	Pig iron	Ferro-alloys
Jan., 1940.....	166,496	104,703	8,065
Dec., 1939.....	150,062	94,620	10,494
Jan., 1939.....	78,198	57,660	2,855

January output of automobiles totaled 17,213 units, compared with 16,978 in December and 14,974 in January, last year. January exports of cars and trucks totaled 4989, against 8519 in January, 1939.

Iron and steel imports in January were valued at $17,110,000 compared with $9,868,000 in the first month last year. Imports from the United States were valued at $15,204,000 compared with $8,672,000 in the corresponding 1939 month. Steel and iron exports for the month were valued at $6,132,000 compared with $6,144,000 a year ago. Exports to the United States were valued at $302,000 compared with $376,000 a year ago.

Liner America Nears Completion



■ Rapidly nearing completion at Newport News, Va., is the United States liner AMERICA, largest ever built in this country. The ship is 723 feet long, 92 feet beam, accommodates 1219 passengers and crew of 639. This photograph, the first taken of the vessel, was snapped a few minutes after the second streamlined funnel was lifted into position. Acme photo

"Rallies for Recovery" Launched By Manufacturers' Association

■ FIRST of a series of 38 "rallies for recovery" were held last week in Pittsburgh and Louisville, Ky., under the co-sponsorship of the National Association of Manufacturers and local industrial groups. The regional meetings, which will continue through next October in various cities, are designed to clarify industrial thought on current economic problems.

Speaking at the Pittsburgh conference, William P. Witherow, president, Blaw-Blaw Co., said: "We have come here to do a job—or perhaps it is better to say that we are here to energize, improve and give direction to a job which we are already doing and which remains with us when this meeting is over. . . .

"There can be no intelligent and unselfish belittling of this No. 1 responsibility nor of its importance to social progress. . . . It is not enough to do your routine job well, for your very success in bringing a contribution to society may be pictured as an evil by the salesmen of destruction so potent today."

The Pittsburgh meeting was attended by approximately 600 business men from Pennsylvania and surrounding states. The regional sponsoring committee was headed by Mr. Witherow, George A. Blackmore, president, Westinghouse Air-Brake Co., Wilmerding, Pa., W. W. Holloway, president, Wheeling Steel Corp., Wheeling, W. Va., and E. T. Weir, chairman, National Steel Corp., Pittsburgh.

Principal speaker at the meeting (and at most of those to follow) was H. W. Prentis Jr., president of N. A. M. and of the Armstrong Cork Co., Lancaster, Pa. Mr. Prentis said industry, conscious of its social responsibilities, is in a position to take great strides toward economic recovery if there is an end to further experiment, confusion and uncertainty.

Leadership Not Hereditary

"Leadership in industry," he said, "perhaps more than in many other fields, involves grave responsibility for the welfare of all who are led. In most instances, management is entrusted to men not by hereditary succession or through personal friendship, but on account of training, experience, and demonstrated ability."

Mr. Prentis pointed out business management is more and more assuming the characteristics of a profession and as such it is recognizing its social responsibilities and setting high internal performance standards.

Industrial leaders, he continued, recognize management must steadily improve production methods, must foster research, must encourage suggestions from every source, and pass along the fruits of such efforts in the form of higher wages and reduced prices. It must avoid unfair methods of competition and eradicate unethical practices. It must constantly seek to justify the freedom of private enterprise: By producing a higher standard of living with a wide diffusion of life's comforts; by co-operating in the erection of reasonable safeguards against the hazards of human existence; by protecting and enlarging opportunity of workers for self-expression; and by making good use of its freedom to insure the whole structure of personal liberty against impairment.

Labor leaders, said Mr. Prentis, have no less social responsibility in these matters than do leaders in management.

Umpires Needed

"Increasing complexity of our modern life requires more umpiring on the part of public authority than was needed a hundred years ago. But when government ceases to be merely an umpire and with the full strength of its dominating authority steps into the game itself, many a player contends that his chances to win are so greatly diminished that a seat on the sidelines is preferable."

He continued, "Let me give certain concrete illustrations that seem to me to show how not to regulate private enterprise. The national recovery administration started out with high hopes of setting things to rights in industry and commerce. It bogged down of its own weight when those in control sought to drag in the butcher, the baker and the candlestick maker. The Supreme Court, by tempering justice with mercy, unanimously decided that the national industrial recovery act was unconstitutional. We then began to breathe easier.

"Perhaps this great industrial city of Pittsburgh would today be out of the economic fog and well on the road to real prosperity if the NRA had been permitted to remain as dead as the Supreme Court made it. But NRA would not stay dead. So now we have:

"The Walsh-Healey act, under which the secretary of labor is empowered to tell industry how to run its business if it would participate in federal government contracts.

"The bituminous coal act, clearly designed to regiment that great industry.

"The Wagner act and its labor relations board, which we were assured would bring peace to industry. Instead of bringing peace, the administration of the present law has brought strife, controversy and confusion.

"The fair labor standards act—wages and hours—which (admirable though its objectives may be) further hamstrings much legitimate activity in industry and commerce.

"The Robinson-Patman act which attempts to regiment the countless millions of sales transactions that occur in America every day."

February Industrial Gear Sales Down 5.7 Per Cent

■ February industrial gear sales were at 116 points, down 5.7 per cent from January's 123, according to index of American Gear Manufacturers' association, Wilkinsburg, Pa. Index, however, was 35 per cent ahead of 86 points for February, 1939.

Sales for two months' period ended Feb. 29 were 35 per cent greater than in corresponding 1939 period. January index was 91 points. Highest since 1937 was last October, 141 points. Average for 1928 is 100.

Machine Tool Builders' Activity Down Slightly

■ Machine tool builders February operations tapered to 92.9 per cent of capacity from the 93.3 per cent of January and December, according to Machine Tool Builders' association, Cleveland.

February, 1939, activity was at 56.1 per cent of capacity. Operations rose steadily to December peak as follows: March, 58.7 per cent capacity; April, 61.2; May, 63.6; June, 65.5; July, 65.8; August, 72.6; September, 74.6; October, 84.9; November, 91.2 and December, 93.3.

Republic Steel Corp. Expands in South

■ Capacity of wide plate mill in Gulfsteel district of Republic Steel Corp., Gadsden, Ala., will be increased by addition of a third slab-heating furnace.

New buildings include a 110 x 220-foot addition to the plate mill warehouse and a 72 x 336-foot addition to Truscon Steel Co., Republic subsidiary, to house a third mesh-making machine.

Light Steels for Consumer Goods 45 Per Cent of 1939 Shipments

■ LIGHT steel products, used principally by consumer goods industries, constituted more than 45 per cent of the total of 38,850,000 net tons of finished steel shipped by the steel industry last year, according to reports of the American Iron and Steel institute.

Proportion of light products to total shipments last year was higher than in either 1936 or 1937, but fell below 1938 when light steel products were 46.3 per cent of the total of 23,512,000 net tons of finished steel.

Shipments of finished steel last year were 65 per cent above 1938, but fell below 1936 and 1937 by 4 per cent and 8 per cent respectively. Light products were 43 per cent of the total in both 1936 and 1937.

Shipments last year of light steel products, including sheets and strip steel, tin plate and wire products, totaled 17,524,000 net tons. Shipments of heavy products such as rails, structural shapes, plates, bars, pipe, etc., totaled 21,327,000 tons. Capital goods industries such as railroads, construction, machinery, etc., are the largest users of heavy steel products.

Automobile industry was the largest consumer of steel products in both 1938 and 1939, while the construction industry ranked second in both years. Shipments of the classes of steel products of which the automobile industry is the largest user represented 27.5 per cent of total shipments in 1939, as against 25.7 per cent in 1938.

Tonnages of steel products used in construction represented 23.0 per cent of total shipments in 1939, compared with 24.4 per cent the year before.

Purchases of steel by railroads apparently represented a greater part of the total in 1939 than in 1938. Shipments of rails, rail fastenings, car wheels and axles represented 5.7 per cent in 1939 and 4.9 per cent in 1938.

Tin plate, most of which is used to make tin cans, represented 7.8 per cent of 1939 shipments, compared with 8.4 per cent in the preceding year.

What's New at Pittsburgh . . .

By R. L. HARTFORD, Pittsburgh Editor, STEEL

■ IN A STORY in the Aliquippa *Gazette*, H. E. Lewis, president and chairman, Jones & Laughlin Steel Corp., outlines some interesting future plans J&L has for its works in Aliquippa. Mr. Lewis states the corporation has complete plans for modernizing and expanding the big plant, awaiting only proper business conditions. Last year $2,500,000 was spent in plant improvement.

Aliquippa, which has always been known as a "company town," is fast becoming independent of all corporation influences. The company's policy has changed, over the years, and it is now aiding in many ways to make the town independent of the mills. Mr. Lewis emphasized that Aliquippa will never be a ghost town; that outmoded equipment will be replaced with modern units rather than let the works become obsolete.

In the past few years Jones & Laughlin has been encouraging the construction of new private homes using private capital. Recently the company has also been attempting to bring in additional industry to diversify the town's interest. Emphasis has been on metalworking companies which would use the steel mill's output.

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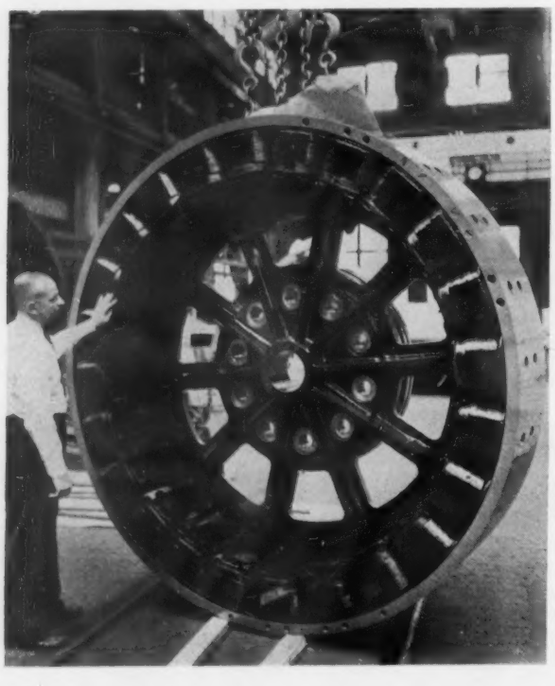
Italians May Buy Coal

Pittsburgh Coal Co. has sent Earl Robertson to Rome to negotiate with Italian buyers of coal, hoping to obtain part of the business normally supplied by Germany, which has now been halted by the British blockade of German exports. Biggest stumbling block is the transportation cost. While American coal can be sold for considerably less than the European product, the cost of transportation in normal times is prohibitive. Rail rates for movement of coal to Baltimore, the nearest gateway, amount to $2.50 per ton from most points in this area, or more than the price of the coal in some cases.

To this local cost must be added the cost of shipping it, which is abnormally high due to the war. Costs now run better than $15 per ton in most cases. There is a possibility that the coal might be barged down to New Orleans and shipped from there, although the costs on this method vary little from the rail-water route.

However, Mr. Robertson will negotiate with several neutral nations and some sources here believe there is good chance the Pittsburgh district may secure some export business. Credit problems must be solved in most cases, which may prove too

Magnetic Coupling For Ship Propeller Absorbs Shocks



■ **Outside rotating member of magnetic coupling for the maritime commission ship MORMACPENN built by Sun Shipbuilding and Drydock Co., Chester, Pa., drives propeller through gears. Inside member is driven by high-speed diesel engine and resembles induction-motor rotor, smoothes torque pulsations and absorbs vibration. Efficiency is 97.5 per cent. Photo courtesy Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.**

great a stumbling block to overcome.

Pittsburgh Coal Co. also issued last week its annual report, showing a loss of $1,068,786. This is considerably less than the 1938 figure. Chairman Alan M. Scaife and president J. D. A. Morrow indicated considerable uncertainty in the future because of the impending price fixing action of the federal government. This will, according to the company, place it at the mercy of the bituminous coal commission, making it impossible to indicate what volume of business may be expected in the future. Back dividends on the company's preferred stock now amount to $112.88 per share, totalling nearly $40,000,000.

Steel Co. of Canada To Install New Mill

■ Officials of the Steel Co. of Canada Ltd., Hamilton, Ont., approved plans last week for the construction of a 4-high mill for the production of plates. Contracts for the equipment will be let as soon as possible. New mill is to be installed with intention that at some future time it will become a part of the roughing train of a 4-high continuous strip mill. Consulting and engineering service is under the direction of C. H. Hunt, 1213 First National Bank building, Pittsburgh.

1939 Nickel Consumption Reaches All-Time High

■ World nickel consumption last year reached an all-time high. In his annual report to stockholders, Robert C. Stanley, chairman and president, International Nickel Co. of Canada Ltd., Copper Cliff, Ont., estimates total consumption last year was 256,000,000 pounds.

This was an increase of 52,000,000 pounds over 1938's 204,000,000 pounds and 16,000,000 over the previous peak year, 1937 when 240,000,000 pounds were consumed. Approximately 200,000,000 pounds were consumed in 1936 and about 160,000,000 in 1935.

Plant Facilities Offered At Newcomerstown, O.

■ Portion of James B. Clow & Sons plant facilities at Newcomerstown, O., have been divided into six building groups for liquidation by Hetz Construction Co. Inc., Warren, O., and are offered to industries wanting to locate or expand in the area.

Some buildings are suitable for light manufacturing while others, with crane service, will house heavier industries. Liquidation program includes disposal of equipment as well as land and buildings.

Production

Operating Rate Down Point to 62.5 Per Cent

■ STEELWORKS operations last week declined 1 point to 62.5 per cent. Two districts made gains, six reduced production and four were unchanged. A year ago the rate was 56.5 per cent; two years ago it was 32 per cent.

Youngstown, O.—Up 1 point to 42 per cent as an open hearth was added, giving 38 open hearths and three bessemers in production. Indications for this week are for little change.

Chicago—Drop of ½-point to 59½ per cent because of curtailment by two large producers and a small mill, partly balanced by resumption of bessemer output by another producer.

Detroit—Gained 4 points to 82 per cent as one open hearth was returned to service, making a total of 21. A decline is expected this week.

Birmingham, Ala.—Unchanged at 78 per cent, with 19 open hearths in production.

Pittsburgh—Loss of 6 points to 55 per cent on general curtailment by all producers.

St. Louis—Dipped 5 points to 60 per cent. Withdrawal of two furnaces was only partially offset by addition of one unit at another plant.

Wheeling—Off 10 points to 80 per cent.

Buffalo—Receded 4½ points to 51 per cent as two open hearths were dropped.

Central eastern seaboard—Steady at 60 per cent.

New England—Reduction of 5 points to 70 per cent as one interest reduced activity.

Cleveland—Continued at 73 per cent, with most plants expected to be unchanged this week.

Cincinnati—Held at 54½ per cent, with only small changes in early prospect.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Mar. 16	Change	Same week 1939	1938
Pittsburgh	55	— 6	50	30
Chicago	59.5	— 0.5	56.5	30
Eastern Pa.	60	None	40	29
Youngstown ..	42	+ 1	54	27
Wheeling	80	—10	73	38
Cleveland	73	None	54.5	30.8
Buffalo	51	— 4.5	33.5	28
Birmingham ..	78	None	78	61
New England..	70	— 5	65	15
Cincinnati	54.5	None	55	25
St. Louis	60	— 5	57.5	37
Detroit	82	+ 4	76	33
Average	62.5	— 1	56.5	32

Steel Corp. Shipments Decline in February

■ Finished steel shipments by the United States Steel Corp. in February were 1,009,256 net tons, a decline of 136,336 tons from January but an increase of 261,829 tons over February, 1939. Two months aggregate shipments this year were 2,154,848 tons, compared with 1,618,293 tons in the corresponding period last year.

U. S. Steel Corp. Shipments

(Inter-company shipments not included)

Net Tons

	1940	1939	1938	1937
Jan.	1,145,592	870,866	570,264	1,268,403
Feb.	1,009,256	747,427	522,395	1,252,845
March		845,108	627,047	1,563,113
April		771,752	550,551	1,485,231
May		795,689	509,811	1,443,477
June		807,562	524,994	1,405,078
July		745,364	484,611	1,315,353
Aug.		885,636	615,521	1,225,907
Sept.		1,086,683	635,645	1,161,113
Oct.		1,345,855	730,312	875,972
Nov.		1,406,205	749,328	648,727
Dec.		1,443,969	765,868	539,553
Total, by Months		11,752,116	7,286,347	14,184,772
Adjustment ..		*44,865	†29,159	*87,106
Total		11,707,251	7,315,506	14,097,666

†Increase. *Decrease.

Current Events in Chicago . . .

By J. F. POWELL, Chicago Editor, STEEL

■ SMALL agricultural equipment such as tractors and combines is meeting good demand for use on the smaller farms and for auxiliary use on the more extensive acreages. While these smaller pieces of equipment naturally do not require individually as much iron and steel as the larger types, their production has of late been a prominent factor at implement plants in the Midwest, with total production a decided boon to the iron and steel industry.

Last week several implement manufacturers expressed enthusiasm over the good prospects for sales of their small equipment. International Harvester Co., Chicago, announced a new, small, grain-harvesting combine, which will be the smallest and lowest-priced combine yet made by the company. The new machine, to be produced at East Moline, Ill., will require approximately ¾-ton of iron and steel each, in contrast to larger models which use as much as 1½ to 3½ tons each. It will harvest and thresh all commercially-grown small grains such as wheat, barley, oats, rye, and soy beans, also many legumes, grasses, and special seeds.

Cost of the machine being little more than a power-driven grain binder, small farms will be able to utilize the same economical combine harvesting as larger farms using larger combines. The new machine costs $405 plus freight from the factory.

A streamlined effect has been attained by a turret-shaped top and sides. Formed sheet steel body serves as a frame, as in automobile construction, while top and sides are stamped out in the same economical manner as automobile tops and sides.

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Wage-Hour "Honeymoon" Over

Col. Phillip B. Fleming, wage-hour administrator, last week outlined to Illinois Manufacturers' association the policies that he will pursue in administering the fair labor standards act.

Most serious criticism has been the allegation that the division has failed to enforce the law's provisions. Vast majority of employers, while proposing to abide by its provisions, have feared competitors would evade the law and thus gain an unfair competitive advantage.

First year and a half of the division's existence had the spectre of the NRA leaning over its shoulder whispering, "Enforce this law or you will end up the way we did!", Colonel Fleming said.

But it was vital, he stated, that they start slowly. Primary task was to inform the country of the law's provisions and coverage; secondary task was to work out the complicated job of enforcing a statute affecting twelve and a half million workers and 250,000 employers. "This so-called honeymoon period ended over a year ago when we moved into second gear and began bringing willful violators into court," he stated.

In some cases, it was pointed out, employers learned of the prosecution of violators and hastened to inform the division voluntarily that they thought they were covered by the law, had been unwittingly violating it, and would like to pay all the back wages due.

Exactly what firms are covered by the law can be decided in borderline cases only by the court

Iron, Steel Imports Continue To Decline

■ Imports of steel and iron in January showed the fourth consecutive monthly decline, according to the metals and minerals division, bureau of foreign and domestic commerce. Total imports in January, excluding scrap, were 7832 gross tons, valued at $920,533, compared with 13,442 tons valued at $1,099,177 in December and 24,331 tons valued at $1,729,145 in January, 1939.

Shrinkage of 5610 tons in January trade from December total was more than accounted for by the drop in spiegeleisen, from 5767 tons to only 78 tons. Other decreases were offset by larger imports of several items. Ferromanganese shipments were 1945 tons, compared with 1285 tons in December; pig iron imports were 1914 tons, compared with 1318 tons.

Sweden furnished the largest January tonnage, 2515 tons, including 963 tons of wire rods, Norway, 1996 tons, including 1945 tons of ferromanganese and British India, 1599 tons of the 1914 tons of pig iron. Canada's shipments were only 689 tons and Belgium's 667 tons.

Scrap imports also declined in January, to 442 tons, valued at $4423, compared with 1267 tons valued at $15,473 in December. In January, 1939, scrap imports were 3333 tons valued at $30,707. Mexico furnished 289 tons of January scrap imports and Canada 99 tons.

U. S. FOREIGN TRADE IN IRON AND STEEL, INCLUDING SCRAP

Gross Tons

	1940		1939	
	Exports	Imports	Exports	Imports
Jan.	583,521	8,274	362,672	27,664
Feb.	.....	.....	359,690	19,149
Mar.	.....	.....	474,360	25,369
April	.....	.....	394,008	44.083
May	.....	.....	532,641	28,142
June	.....	.....	588,856	32,587
July	.....	.....	513,664	30,851
Aug.	.....	.....	477,078	28,328
Sept.	.....	.....	575,613	29,874
Oct.	.....	.....	591,856	19,189
Nov.	.....	.....	605,555	15,216
Dec.	.....	.....	600,437	14,709
Total	.....	.....	6,076,429	315,161

ORIGIN OF JANUARY IMPORTS

Gross Tons

	Iron ore	Pig iron	Manganese ore	Ferromanganese
Sweden	36,072	.....	.....	.....
United Kingdom	49	.....	.....	.....
Mexico	97	.....	25	.....
Cuba	31,700	.....	.....	.....
Chile	141,500	.....	2,659	.....
Japan	3	.....	.....	.....
Canada	.....	315	.....	.....
British India	.....	1,599	2,982	.....
Philippines	.....	.....	1,913	.....
Brazil	.....	.....	5,368	.....
Soviet Russia	.....	.....	17,501	.....
Gold Coast	.....	.....	8,961	.....
Norway	.....	.....	.....	1,945
Total	209,421	1,914	39,409	1,945

	Sheets, skelp and sawplate	Structural steel	Steel bars	Hoops and bands
United Kingdom	7	10	9	...
Canada	1	...	1	...
Belgium	...	206	129	214
Sweden	...	...	261	1
Germany	...	...	...	90
Total	8	216	400	305

UNITED STATES IMPORTS FOR CONSUMPTION OF IRON AND STEEL PRODUCTS
(Gross Tons)

Articles	Jan. 1940	Dec. 1939	Jan. 1939
Pig iron	1,914	1,318	586
Sponge iron	12	176	34
Ferromanganese (1)	1,945	1,285	3,150
Spiegeleisen	78	5,767	976
Ferrochrome (2)	.....	.....	.....
Ferrosilicon (3)	269	108	74
Other ferroalloys (4)	50	77	25
Steel ingots, blooms, etc.	.....	4	1
Billets, solid or hollow	204	139	7
Concrete reinforc. bars	.....	.....	365
Hollow bar and drill steel	189	100	100
Bars, solid or hollow	400	504	2,188
Iron slabs	.....	.....	.....
Iron bars	85	180	50
Wire rods	1,037	1,058	1,196
Boiler and other plate (including skelp)	1	1	.....
Sheets, skelp, saw plate	8	2	171
Die blocks or blanks, etc.	.....	1	.....
Tin plate, taggers' tin and terneplate	3	19	3
Structural shapes	216	667	3,534
Sashes and frames	.....	.....	.....
Sheet piling	.....	.....	.....
Rails and track material	109	16	241
Cast-iron pipe, fittings	.....	115	32
Mall. iron pipe fittings	.....	.....	.....
Welded pipe	.....	.....	270
Other pipe	412	363	6,550
Cotton ties	.....	.....	2
Other hoops and bands	305	265	1,894
Barbed wire	.....	325	1,012
Round iron and steel wire	200	269	285
Teleg. and telephone wire	.....	1	1
Flat wire and steel strips	230	335	270
Wire rope and strand	81	106	240
Other wire	.....	8	240
Nails, tacks, and staples	38	171	553
Bolts, nuts, and rivets	5	13	12
Horse and mule shoes	3	...	45
Castings and forgings	38	49	224
Total	7,832	13,442	24,331
Iron and steel scrap	442	1,267	3,333
GRAND TOTAL	8,274	14,709	27,664

(1) Manganese content; (2) chrome content; (3) silicon content; (4) alloy content.

Government "Tinkering" Assailed As Obstacle to Business Recovery

■ OBSTACLES created "largely by government tinkering with the delicate machinery of our complex industrial organization" are preventing true recovery in the United States, declared T. M. Girdler, chairman, Republic Steel Corp., Cleveland, before the Boston chamber of commerce last week.

Mr. Girdler assailed the growth of the "fourth branch" of government, of bureaus, boards and commissions that promulgate rules that are in effect laws and from which in many cases there is no appeal.

"As a result of this situation, perhaps even more than in the effects of congressional action, business cannot depend on a definite, consistent governmental policy justifying or encouraging planning ahead."

Barriers in the path of enterprise were cited by Mr. Girdler as follows:

"Policies tending to prevent efficient management. These include the enactment of a one-sided labor law and its high-handed administration. They include the restrictions, the red tape, and the harassments imposed upon enterprise by a bewildering maze of federal bureaus, commissions, boards and investigations.

"Policies tending to destroy the confidence of investors. In this category there is the government's competition with private industry, as in the utility field. There are the complicated requirements for new security issues which involve such cost and delay that the issuance of new securities is discouraged. There are the restrictions upon the security exchanges so extreme that the markets appear to have dried up.

Radicals in Federal Posts

"There are the increasing government-made difficulties faced by industry in attempting to earn a reasonable return from operations and to pay a fair return to investors. Millions of small investors and holders of insurance policies are bearing the brunt of the attacks and restrictions upon so-called Big Business.

"Policies tending to upset confidence and discourage business in general. These policies include the spend-lend program of government financing, resulting in a crushing federal debt load, in burdensome taxes, and in fears of coming inflation. In this category also I would place the undisguised antipathy toward business in government circles, and the filling of many federal posts with persons of radical views and lacking in either maturity or experience. I would include here also the engendering of ill will and suspicion between various economic groups in the country."

Mr. Girdler contended the Wagner labor act had "created one of the most disastrous periods of labor troubles and turmoils in the country's history."

"Heralded upon enactment as ushering in an era of industrial peace, the Wagner law has been used to play the game of a powerful labor organization."

Reasonable Regulation Desirable

The speaker declared he believed in every reasonable regulation of business enterprise which is truly in the public interest, but that he opposed every control and restriction which would place arbitrary power in the hands of government and destroy private enterprise.

"Many of the avowed objectives of the new deal are commendable in themselves . . . . Perhaps the purpose of the so-called reformers actually is to make capitalism work, but in many cases they are like a well-meaning but inexperienced mechanic trying to start a stalled automobile by removing the carburetor and pouring sorghum molasses into the gasoline tank."

Mr. Girdler termed such social reformers "phoney liberals," called for a truer definition of liberalism.

Westinghouse Air Circuit Breakers Demonstrated

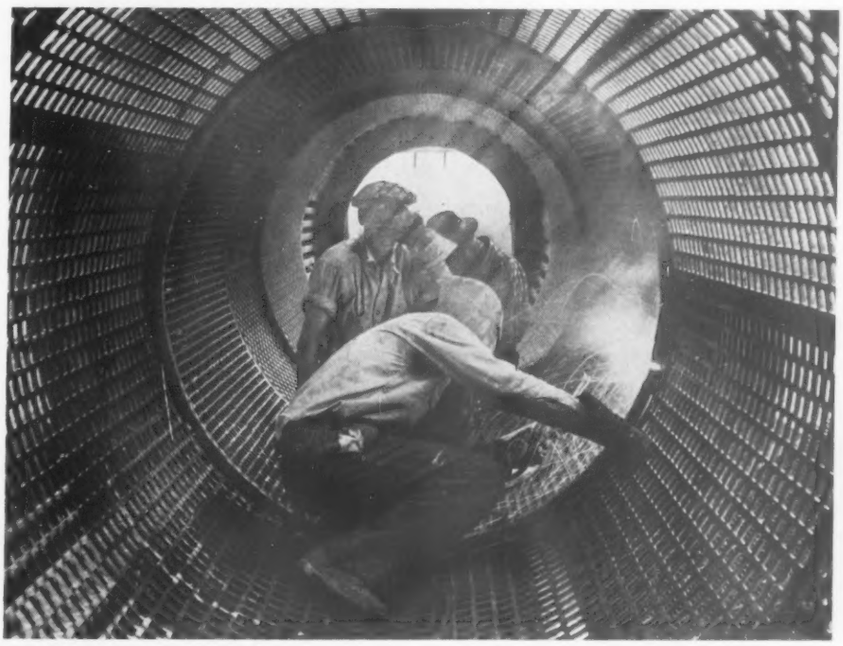
■ Testing of a compressed air circuit breaker during a demonstration held by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., March 8, was witnessed by more than 100 engineers and executives in steel industry.

Newly-developed device, the compressed-air breaker was tested on power interruptions ranging from normal load current opening of 2000 amperes at 13,200 volts to the three-phase, 1,500,000 kilovolt-ampere short circuit capacity of the high-power laboratory.

Oscillograms made during the demonstration showed all currents were interrupted at first current zero, with about one-half arcing cycle. No transient voltage greater than twice normal was observed throughout entire test range.

Second series of tests was applied to a smaller new air breaker, utilizing an adaptation of the "deion" principle.

Welding Gravel Screens at Shasta Dam



■ **Shasta dam, second only to Boulder dam in height and exceeded only by Grand Coulee in mass, has made necessary the relocation of the Southern Pacific railroad along the Sacramento river in California. Preliminary work on the relocation project has been started at Pollock, Calif. To speed construction, these gravel screens are welded. Photo, courtesy General Electric Co., Schenectady, N. Y.**

MEN of INDUSTRY

■ ALBERT J. BERDIS has been appointed chief engineer, Irvin works, Carnegie-Illinois Steel Corp. He succeeds Edwin T. Lorig, who has been promoted to the staff of the corporation's chief engineer at Pittsburgh.

A graduate in electrical engineering from Purdue university, Mr. Berdis has been with subsidiary companies of United States Steel Corp. since 1929, when he joined the former American Sheet & Tin Plate Co. as fuel engineer at Gary, Ind. Mr. Lorig, a graduate of University of Wisconsin, has been with Steel corporation subsidiaries 22 years. He supervised construction of Irvin works and since September, 1938, was chief engineer of the plant.

♦

D. Robert Yarnall, president, Yarnall-Waring Co., Philadelphia, has been named to the business advisory council of the United States department of commerce.

♦

W. W. Graff, heretofore manager, Negaunee and Athens iron ore mines of the Cleveland-Cliffs Iron Co., has been named manager of the Negaunee, Mich., district.

♦

E. W. Abrahamson, 420 Lexington avenue, New York, has been appointed representative in metropolitan New York and northern New Jersey for C. M. Kemp Mfg. Co., Baltimore.

♦

Paul S. Lane has joined Muskegon Piston Ring Co., Muskegon, Mich. He formerly was research engineer and metallurgist for American Hammered Piston Ring division, Koppers Co., Baltimore.

♦

George L. Gordon, heretofore in charge of the New York office of Lukens Steel Co., Coatesville, Pa., has been transferred to Coatesville, where he will engage in special sales work. J. J. Reynolds, sales representative in the New York office the past 13 years, has been appointed manager of sales at New York.

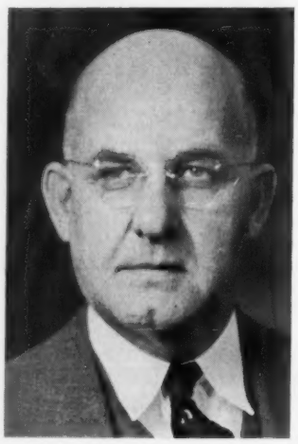
♦

F. B. Cornell and C. H. Knappenberger have been appointed agents in the state of Michigan for Duraloy Co., Scottdale, Pa. This new agency is known as Duraloy Co. of Detroit, with offices at 1124 Ford building, Detroit.

♦

Robert S. Crawford has been appointed superintendent of rolls, Timken Roller Bearing Co., Canton, O. He will assist Gene Ball, superintendent of rolling mills. Mr. Crawford joined American Steel & Wire Co. in 1915, remaining there until 1918. He then joined Bourne-Fuller Co. and later became roll foreman for Republic Steel Corp., Cleveland; from this position he was promoted successively to roll designer and roll engineer.

Albert J. Berdis



Edwin T. Lorig

J. J. Reynolds

♦

Harry F. Griscom has been elected vice president in charge of sales, Ross-Meehan Foundries, Chattanooga, Tenn.

♦

Jay Irwin, since October, 1937, a salesman in the Chicago branch office of Steel & Tube division of Timken Roller Bearing Co., Canton, O., has been named Chicago district manager, Steel & Tube division. Prior to joining Timken in 1937, he was associated with Canton Sheet Steel Co., Milwaukee Rolling Mill Co., and Inland Steel Co.

♦

Arden L. Knight, formerly New England sales manager for Wheelock Lovejoy Co., Cambridge, Mass., has joined the sales force of the Hartford, Conn., office of Latrobe Electric Steel Co., Latrobe, Pa. Mr. Knight is chairman, Boston chapter, American Society for Metals.

♦

Frank E. Graper has been appointed president and general manager, Acklin Stamping Co., Toledo, O., to succeed the late W. Collard Acklin. F. Cyril Greenhill is vice president and general sales manager, and Alvin E. Seeman, vice president and treasurer.

♦

William R. Bauer, manufacturers' representative, Park building, Pittsburgh, has been appointed representative for Hill Clutch Machine & Foundry Co., Cleveland, manufacturer of power transmission equipment, special machinery and gray iron castings.

♦

Charles M. Chapman, Schmidt building, Cincinnati, has been appointed representative for Hays Corp., Michigan City, Ind., maker of combustion instruments and automatic combustion control. He will cover southern Ohio and contiguous territory in Kentucky and Indiana.

♦

Grady Gray has been appointed plant manager in charge of production, Chattanooga Stamping & Enameling Co., Chattanooga, Tenn. He formerly was in charge of production, Florence Stove Co., Gardner, Mass. John A. Mott, heretofore with Florence Stove, has also joined the Chattanooga firm, in the capacity of efficiency engineer.

♦

C. D. Macpherson, of the hoist and body division of Gar Wood Industries Inc., Detroit, has been reappointed a member of the board of

directors and also continues on the executive committee, manufacturers' division, American Road Builders' association, Washington.

♦

H. R. Simonds, Dayton, O., has been elected president, Safety Grinding Wheel & Machine Co., Springfield, O. Other officers are: Vice president and general manager, William H. Cool; secretary, Dr. F. R. Henry; treasurer, George E. Vance. N. S. Talbott, of Dayton, was elected a director.

♦

John F. Dolan, associated with Peck, Stow & Wilcox Co., Southington, Conn., since 1910, and since 1934 assistant sales manager of the small tools and hardware division, has joined the Chicago sales organization of Lamson & Sessions Co., Cleveland. He will represent the company in Iowa, Kansas, Missouri, Nebraska, North and South Dakota and Oklahoma.

♦

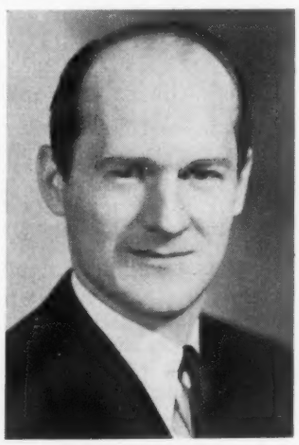
Charles E. Mayette has joined the sales engineering staff of Underground Steam Construction Co., Boston, subsidiary of E. B. Badger & Sons Co., Boston. Mr. Mayette's activities will be mainly in connection with contracts for installation of high pressure and high temperature piping for central stations, industrial and process plants.

♦

Louis Kuehn has retired as chairman of the board, Milcor Steel Co., Milwaukee, but will continue as a director of the parent company, Inland Steel Co., Chicago. He entered the steel business as a punch press operator with Berger Mfg. Co., Canton, O. In 1902 he organized Milwaukee Corrugating Co., Milwaukee, now Milcor Steel Co. Milcor was sold to Inland in 1936.

♦

Joseph A. Schultz, associated with Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., since November, 1938, has been appointed purchasing agent of the Mansfield, O., works. Mr. Schultz spent five months with Westinghouse in the purchasing department at Pittsburgh, and has been in the Mansfield purchasing department since April 1, 1939. He succeeds J. E. Lautsbaugh, resigned.



Joseph A. Schultz

John F. Dolan

♦

Gano Dunn, president, J. G. White Engineering Corp., New York, has had bestowed upon him the decoration of the Order of Honneur et Merite by the Haitian government. Mr. Dunn was cited for outstanding service in the economic upbuilding of the Republic, where the corporation, as agent for the government of Haiti, has 8500 men at work on 75 construction projects.

Died:

■ CHARLES ARTHUR WHITE, 58, secretary-treasurer, Leeds & Northrup Co., Philadelphia, in Philadelphia, March 2. He joined Leeds & Northrup as chief accountant in 1920, eight years later becoming secretary-treasurer.

♦

Charles Edward Conley, 79, manager, city sales department, Chicago warehouse of Jones & Laughlin Steel Corp., recently. Mr. Conley was rounding out 56 years service with the company in Chicago.

♦

John H. Sullivan, 68, president, Sullivan-Becker Machine Co., Kenosha, Wis., March 5. He organized the firm in 1923 after leaving the tool department of J. I. Case Co., Racine, Wis.

♦

Walter J. Guthrie, 76, former president, Apollo Steel Co., Apollo, Pa., March 2 at his winter home in Miami, Fla. Since 1905 he was associate general counsel of Gulf Oil Corp. and many of its subsidiaries.

♦

John Ross Bates, 60, eastern sales manager, Shaw-Box Crane & Hoist division, Manning, Maxwell & Moore Inc., in Plainfield, N. J., March 12. He had been with the Manning company ten years and before that was with the Whiting Corp., Harvey, Ill., as vice president in charge of New York and New England sales.

♦

James W. Keogh, 84, former executive, International Harvester Co., Chicago, March 1 in Indianapolis. He was the company's general agent in Australia from 1899 to 1906, when he became general manager of its South American branches.

♦

Martin H. Welch, 72, veteran blower of blast furnaces for Ford Motor Co., Detroit, in that city, March 8. He was engaged in producing pig iron 60 years, being one of the early blowers on a Shenango Valley, Pa., stack using Mesabi iron ore exclusively. He also worked for Brier Hill Iron & Coal Co., Republic Iron & Steel Co., Pickands, Mather & Co., and M. A. Hanna Co.

♦

David C. Jones, 63, vice president and general manager, Lunkenheimer Co., Cincinnati, March 11, in Cincinnati. He had been with Lunkenheimer 46 years. Mr. Jones was prominently identified with industrial and banking activities in Cincinnati and also had served as president, American Supply & Machinery Manufacturers' association.

♦

Arthur H. A. Kunz, tin plate salesman, New York office, Wheeling Steel Corp., Wheeling W. Va., at his home in Hempstead, Long Island, March 8. He joined the New York sales office of Wheeling in 1936, and before that was with Dickerson, Van Dusen & Co., New York, from 1900 to 1936, when the company was liquidated.

♦

John A. Geismar, 61, president, National Supply Co., Pittsburgh, at his home in Toledo, O., recently. He joined the company as a clerk in 1901, subsequently becoming manager of the company's store at Toledo; head of the general sales organization and vice president and general manager. He assumed the presidency last April.

♦

Thomas Weiskopf, 57, superintendent, Massillon, O., plant, Union Drawn Steel division of Republic Steel Corp., in Massillon, March 9. With Union Drawn Steel since 1903, Mr. Weiskopf went to Massillon eight years ago from Beaver Falls, Pa., where he was superintendent of the company's plant there.

♦

Henry C. Milligan, 87, chairman of the board, Republic Stamping & Enameling Co., Canton, O., in Canton, March 8. He organized the company in 1901, and served as president, treasurer and a director many years. He also was vice president and a director, Federal Machine & Welder Co., Warren, O.

Windows of *WASHINGTON*

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ APPROPRIATION bills are working their way through congress, and certain legislation of particular interest to industry is being prepared in an effort to obtain action before the session adjourns.

Among these are amendments to the Walsh-Healey act, the labor relations act, the wage and hour law, and the bill dealing with occupational diseases. Latter bill has developed into a fight for jurisdiction between the secretary of labor, the United States public health service, and state labor boards.

Stream pollution bill of considerable interest to the steel industry recently passed the house in an entirely different form than approved by the senate. Industrial observers in Washington think the bill that passed the house would be extremely harmful to industry.

Feeling is strong on Capitol Hill that no action will be taken at the present session on the labor act amendments. This probably will be ammunition for the presidential campaign.

Labor department officials have changed their ideas about Walsh-Healey public contracts act and believe there is a good chance it will be amended, particularly since black list amendment has been stricken from the bill.

The act was passed in 1936, but did not attract great interest at the time because it was assumed that it would have a very limited effect. However, the act's administration has resulted in interpretations which are rapidly widening its effect. Amendments now proposed would further widen its scope and link it to the national labor relations act.

Amendments passed the senate in July last year would extend the act's scope to contracts involving $4000 or over instead of $10,000 as at present. Hearings have been held before the house judiciary committee on the bill as it passed the senate which would extend the scope of this act by reducing to $2000 the contracts affected. but the house bill would not bring in the labor relations act which would extend the act to federal aid highways.

Indications are the house will not do anything about the hours and wages act until after Colonel Fleming, the administrator, has had an opportunity to make some changes of interpretation.

INVENTORY ACCUMULATIONS SLACKEN IN JANUARY

Inventory accumulation during January, although still substantial, was less than in the preceding two months, according to the department of commerce. Value of inventories increased 2½ per cent in January as compared with successive increases of 3 per cent in both November and December.

Data were reported by 551 companies whose inventories amounted to approximately three and a quarter billion dollars at the end of January. This is more than one-quarter of the stocks held by all manufacturing corporations.

Inventory increases for almost all industrial groups were somewhat smaller in January than in December. In those important durable goods groups for which comprehensive data are available, machinery other than electrical machinery was the only industry which showed a larger inventory increase in January than in December. However, January incoming orders for machinery showed a rise from December while new orders for all durable goods industries combined tended downward.

FARM SUBSIDY PROPOSALS BRING NEW TAX THREAT

Tax question came up last week unexpectedly during a conference at the White House between the President and congressional leaders. The President suggested additional revenue may have to be raised to offset farm parity price subsidies.

Senate appropriations committee has added $212,000,000 to the agriculture appropriation bill for parity payments. This sum is over and above the bill as it passed the house and if this additional amount becomes law, it appears some additional revenue will be needed.

Threat of the new taxes was raised last week while efforts to bring the farm bill before the senate were blocked by refusal of senate members to sidetrack the Hatch political activity bill.

As passed by the house the farm bill called for appropriation of $713,896,084, or $57,000,000 less than budgeted. But the senate committee added the parity fund, plus $85,000,000 to expand the food stamp plan for distribution of surplus commodities. These, with other changes, brought the bill to a total of $922,864,668.

Increases, if approved, would wipe out almost all of the savings effected thus far by economy forces in their drive to obviate the need of raising $460,000,000 in national defense taxes, as requested by Mr. Roosevelt, or raising the $45,000,000,000 national debt limit. Presumably, the increased farm funds would carry the national debt above this limit if offset taxes are not imposed.

SENATE COMMITTEE FAVORS EXTENSION OF TRADE PACTS

Senate finance committee in recommending passage, without amendment, of resolution for 3-year trade agreement act extensions, stated trade program "has stood up under most critical examination in the course of extended hearings."

Furthermore, finance committee says, "it has had perhaps the most widespread endorsement throughout the country which any important piece of tariff legislation has ever enjoyed."

Attention is called in committee's report to absence of suggestions

Speed Nut System

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PREVENT LOOSENING FROM VIBRATION

SPEED NUTS are manufactured from high carbon spring steel and heat treated to provide positive holding power for the life of the product. Made in over 500 shapes and sizes for most standard sizes of machine screws, stove bolts, metal screws, metal rivets, die cast and plastic studs. Many special shapes and sizes also developed for mass production products. Write for samples today, stating sizes desired and nature of application.

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MANUFACTURERS OF PATENTED SPEED NUTS

IN CANADA: Wallace Barnes Co., Ltd., Hamilton, Ontario IN ENGLAND: Simmonds Aerocessories, Ltd., London

OVER 900 MILLION ALREADY USED—OVER 500 SHAPES AND SIZES

"as to feasible alternative on the part of those who oppose it. Many opponents of the trade agreements agree the nation cannot dispense with a foreign trade program of some kind."

Finance committee says most opposition witnesses had no suggestion to offer other than "a return to the policy of excessive tariff such as we had under the tariff act of 1930. Disastrous results of such a policy have been amply demonstrated . . . "

CIO PUBLICATION ASSERTS SERIOUS DEPRESSION NEAR

Economic Outlook, published by Committee of Industrial Organizations, states January unemployment was nearly 12,000,000 and "the country is still hovering on the edge of a very serious liquidation and depression."

Prediction of this liquidation and depression in spite of signs of a slight March halt in "abrupt fall" that took place in January and February is based on analysis of conditions in four basic industries, including steel and automobiles.

In reference to steel industry, CIO says:

"In the last quarter of 1939, 500,000 workers were employed in the steel industry. Since then 25,000 have been laid off, most of the others are working four days a week.

"Steel operations have declined to 65 per cent of capacity, will probably go considerably below that in second quarter.

"Continuous decline in steel operations indicates consumers' stocks of steel were much higher at beginning of the year than industry's spokesmen would admit. Many steel users are now failing to place new orders. Such users are clearly drawing on extensive stocks.

"For example, steel purchases by the auto industry are very low as indicated by the fact the Youngstown district, which depends largely upon automobile orders, is operating at only slightly more than 40 per cent of capacity.

"Already, also, railroads have postponed purchase of 50,000 to 60,000 freight cars.

"Such is the basis for estimating that operations will go as low as 50 per cent of capacity during the second quarter."

Referring to automobile situation, CIO states:

"More and more the automobile industry becomes a focal point in the national industrial picture. It is one of the basic users of steel, rubber, glass, paint and many other products. So far, automobile production continues well ahead of last year. But last year was not a good year for automobile production. In 1939 the industry produced less automobiles than in 1935, 1936 and 1937.

"Dealers' stocks of cars became dangerously high during January and current production is still substantially higher than would be justified by current purchasing power. As a result, the industry is reported to be scheduling production on a week-to-week basis with some increasing signs of nervousness."

URGES BUSINESSMEN SUPPORT WAGNER ACT AMENDMENTS

Appeal to businessmen to support vigorously amendments to Wagner labor relations act, proposed by special Smith house committee, was made by W. Gibson Carey Jr., president, United States chamber of commerce.

While this first step looking towards correctives in the law does not include some changes asked by chamber's membership, they do contemplate, said Mr. Carey, a genuine beginning of early reform in labor relations administration.

Mr. Carey said "amendments to the labor relations act offered to the house should be welcomed. They are the results of months of vigorous examination of the administration of this law conducted by a special committee of the house. . . .

"These amendments are far-reaching. They would prevent many of the tyrannies of the present law. They do not include some of the changes widely supported by businessmen . . . but they have the great advantage of proposing divorcement of the new labor relations board from the powers of investigation and prosecution used by the present board, require observance of the rules of evidence, and protect employers in the proper exercise of free speech. There are many other changes in the direction of fairness to both employers and employes.

"This bill should be supported by all who want a genuine beginning of reform quickly in the labor relations act and its administration. It represents the opportunity for legislation at this session of congress."

CENSUS BUREAU HAS 27,585 MANUFACTURERS' REPORTS

Reports on iron and steel manufacturers' 1939 operations are being received by census bureau at an encouragingly rapid rate, according to Thomas J. Fitzgerald, chief statistician for manufactures.

However, said Mr. Fitzgerald, returns indicate some misunderstanding as to nature of information requested by various questions. Reference to instruction booklet furnished by enumerators is advised whenever doubt arises as to proper answer. Should booklet fail to provide desired assistance, Mr. Fitzgerald advised, district census supervisor should be called.

Returns received by March 1 totaled 27,585, compared to 22,658 at same time two years earlier, and 15,042 four years ago.

FRANCE SUSPENDS IMPORT DUTIES ON STEEL PRODUCTS

French government has suspended import duties in France and Algeria on certain iron and steel products until six months after war ends, according to American embassy at Paris.

Products benefiting include iron and steel, crude, ingot, rolled or forged, machine, hoop, sheet, rails, beams, ordinary gage railway sleepers, parts for portable railways; flat sheet nickel steel; hot-rolled bands.

Duties can be re-established by special decree within six months after war ends. All imports into France and Algeria continue subject to import licenses and exchange certificates.

GOVERNMENT IRON, STEEL PURCHASES TOTAL $843,812

During week ended March 2, government purchased $843,812.33 worth of iron and steel products under Walsh-Healey act as follows: United States Pipe & Foundry Co., Philadelphia, $53,152.52; Bethlehem Steel Co., San Francisco, $167,132.50; Hardie-Tynes Mfg. Co., Birmingham, Ala., $119,000; Truscon Steel Co., New York, $48,058.99 (estimated).

United States Pipe & Foundry Co., New York, $34,720; Barnard Aviation Equipment Co. Inc., Newark, N. J., $14,153.33; Morris Wheeler & Co. Inc., Philadelphia, $32,726.95; Allegheny Ludlum Steel Corp., Watervliet, N. Y., $11,344.75; John A. Roebling's Sons Co., Trenton, N. J., $15,174.37; Bethlehem Steel Co., Bethlehem, Pa., $27,889.43.

Carnegie-Illinois Steel Corp., Washington, $11,247.53; Central Iron & Steel Co., Harrisburg, Pa., $76,429.20; Joseph T. Ryerson & Son Inc., Chicago, $11,760; Pheoll Mfg. Co., Chicago, $16,728.51; Scovill Mfg. Co., Waterbury, Conn., $18,744.48; Reed & Prince Mfg. Co., Worcester, Mass., $27,064.63; Yale & Towne Mfg. Co., Stamford, Conn., $14,864.34.

Tubular Service Corp., Brooklyn, N. Y., $12,473.40; Lukens Steel Co., Coatesville, Pa., $10,651.45; Blaw-Knox Co., Pittsburgh, $26,292; Anthony Carlin Co., Cleveland, $64,950 (estimated); National Cast Iron Pipe, Kansas City, Mo., $11,515.62; and C. J. Rainear & Co. Inc., Philadelphia, $17,738.33.

AVIATION

LIGHT PLANE MAKERS EXPECT RISE IN PRIVATE FLYING

■ BOOM in light planes as a result of widespread student pilot training and advent of installment sales is expected by builders of such craft, who recently held their first meeting in Cleveland at the call of Thomas H. Beck, president of Crowell-Collier Publishing Co., New York, and aviation enthusiast.

Gathered to discuss mass production problems and resultant lowered costs to make planes available to civilian pilots, representatives reported a 110 per cent increase in small plane production in 1939 over 1938. Civil aeronautics authority listed 17,681 licensed civilian pilots in 1938, and 22,983 in 1939, an increase of 30 per cent. By August, 1940, the student pilot training program sponsored by civil aeronautics administration is expected to add 40,000 new certified pilots to this number.

Small planes at $750 is immediate goal, according to Mr. Beck, and within a few years a safe plane for $500 is forecast. Greatest problem today, Mr. Beck pointed out, is lack of airports and hangars.

Light plane sales have increased, but not as much as they would have if plane buyers kept their planes. Within 2½ years, 80 per cent of private purchasers sell their ships, but do not buy another, according to Robert H. Hinckley, chairman, civil aeronautics authority. It is estimated 2900 new owners must be found each year to maintain present sales.

Unofficial but logical explanation by a veteran pilot and dealer in lightplane accessories is that a sea of red tape engulfs the civilian as soon as he enters a plane. Most business men investing in a private plane do so as much from a sense of sport as from a need. Used to giving orders, they now find themselves receiving orders on end from civil aeronautics inspectors and a third of them look for a buyer at the end of the first year.

Trend to Hydraulic Actuators

Due to lowered weight over electrical apparatus, trend is toward hydraulic actuators for cowl flaps, locking mechanisms, retracting landing gear, door latches and bomb releases. Drawback to hydraulic actuators until now had been seepage of oil through aluminum of cylinders and rapid wear of piston glands due to relatively poor finish inside cylinder of actuator, necessitating frequent replacements. Most polishing was done with a lapping compound that ingrained itself into the soft metal and hence detracted from smoothness of finish.

To secure a smooth finish on inside of aluminum and bronze cylinders for these actuators, Pump Engineering Service Corp., Cleveland, has developed an oil-base lapping compound which does not ingrain itself into the metal and produces a mirror finish which has considerably lengthened life of piston gland operating over it.

Cylinder is machined 0.0003 to 0.0005-inch undersize. Polishing is accomplished with the aid of a fluted wooden mandrel rotated by a speed lathe. Compound is applied when cylinder is pressed by hand over mandrel. Result is a bore finished to within 0.0003-inch on diameter.

Actuator cylinders vary in size from 1 inch in diameter and 3 inches long for locking purposes on aircraft to 3 inches in diameter and 3 feet long for landing gear retraction. Present operating hydraulic pressure is standardized at 1000 pounds per square inch. Recent tests, however, on systems up to 5000 pounds per square inch indicate point of greatest weight reduction to be at an operating pressure of 3000 pounds per square inch. With this increased pressure likely to be adopted soon, it is very probable stainless steel will be used for actuator cylinders because of its favorable weight-strength ratio.

Aircraft Steel Shortage

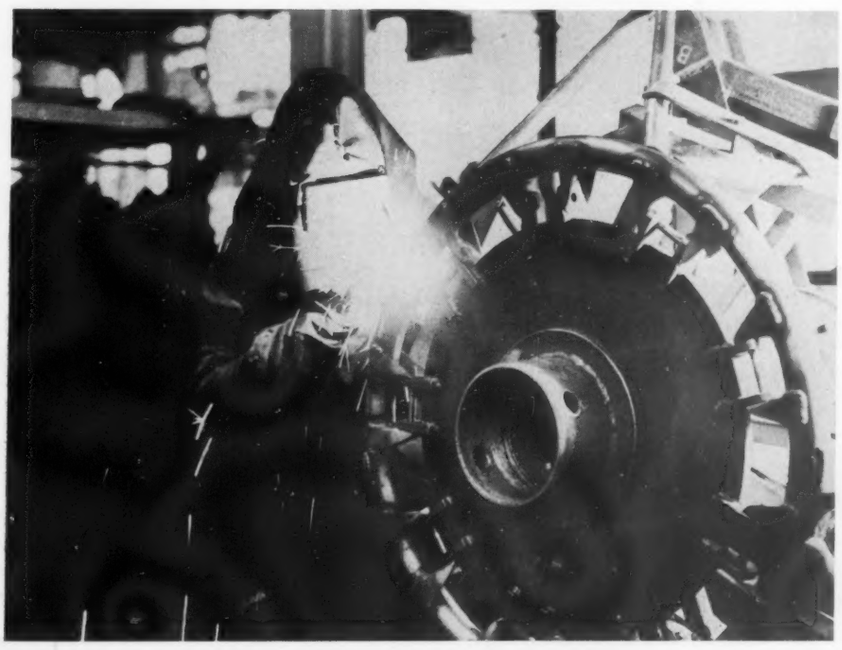
Shortage of electric furnace aircraft steels, such as SAE 2330, X-4130 and X-4340 has resulted in 6 to 14-week deliveries to some aircraft parts manufacturers who could not show government contract numbers. Most electric furnace steels are being inspected at the furnace by navy inspectors and stamped by them with sign of anchor to show heat was of proper analysis. To make sure government will not suffer on deliveries because of the increased demand for these steels, officials have ordered such steels reserved for navy or army use or disposal at their direction. Another contributing factor to the shortage has been the large advance buying by leading aircraft manufacturers.

Despite rising monthly rate of production, backlog of companies listed below has risen $91,000,000 since first of the year. Current backlogs are estimated as follows:

Curtiss-Wright Corp.	$150,000,000
United Aircraft Corp.	145,000,000
Douglas Aircraft Co.	100,000,000
Lockheed Aircraft Corp.	63,000,000
Glenn L. Martin Co.	50,000,000
North American Aviation,	50,000,000
Consolidated Aircraft Corp.	40,000,000
Brewster Aeronautical Corp.	22,000,000
Boeing Airplane Co.	21,000,000
Republic Aviation Corp.	15,000,000
Vultee Aircraft Inc.	15,000,000

United States army released for sale to Allies the Curtiss P-40, a 400-mile-an-hour pursuit plane. Stripped of army secret armament and devices, ship will be designated as Curtiss Hawk 81-A. Allies will arm planes with their own guns.

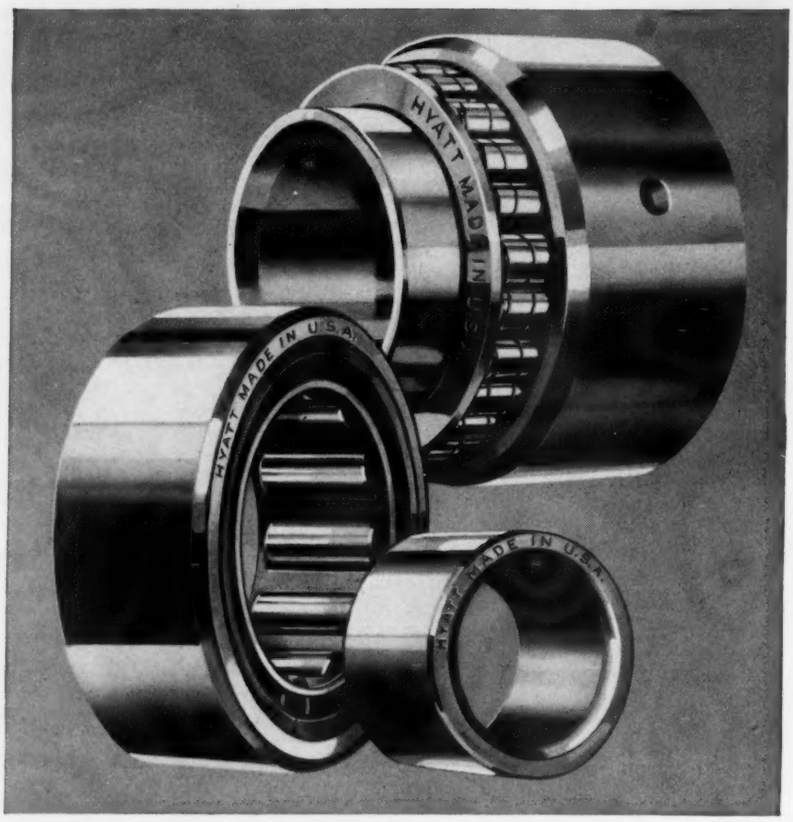
Arc-Welded Engine Mount



■ **Engine mount of the Boeing "Stratoliner" and "Flying Fortress" is arc-welded in mass-production quantities with aid of a special jig to hold all parts in place during welding. Photo courtesy Lincoln Electric Co., Cleveland**

Longer Equipment Life

...Freedom From Care



HYATT WOUND ROLLER TYPE and HY-LOAD SOLID ROLLER BEARINGS shown opposite. Inherent design advantages, uniformity and accuracy along with their capacity for heavy loads account for the widespread application of these better bearings.

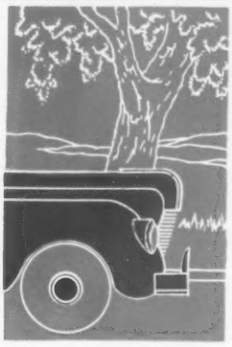
On and on it goes . . . equipment of every description . . . a symphony of mechanical smoothness . . . with gears, shafts, and wheels turning silently, accurately, effortlessly on Hyatt Roller Bearings. Long-lived, carefree bearings that serve so faithfully year after year in the new equipment you buy or the changeovers you make. Is there any application information you desire? Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Detroit, Chicago, Pittsburgh, San Francisco.

HYATT

ROLLER BEARINGS

QUIET

Mirrors of *MOTORDOM*



By A. H. ALLEN
Detroit Editor, STEEL

DETROIT

■ SPARK plugs, or sparking plugs as the British term them, are vital elements in the functioning of gasoline engines, but excepting those people engaged in the manufacture of plugs or in the supply of materials for them, no one pays much attention to them. A quick analysis shows that some 25,400,000 plugs were needed as original equipment for cars built in 1939. This production is divided among a handful of leading manufacturers, including Champion, AC, Electric Auto-Lite, Firestone, Defiance, etc. Although there are in all some 99 plug manufacturers, the bulk of them are content with replacement business.

It is related that spark plugs sold as original equipment are priced at around 6 cents each, probably somewhat under actual cost of manufacture. Profits are sought only on replacement business, and with 30 million cars and trucks being driven in this country, the renewal business in plugs is a handsome one, even in spite of drivers who would never think of taking out worn plugs and putting in new ones.

"Polonium" Plug Introduced

Considerable fanfare attended the introduction of Firestone's "polonium" plug a couple of weeks ago. Polonium is a radioactive element discovered by the late Madame Curie and named in honor of her native land, Poland. Infinitesimal quantities of this element are in some way introduced into the metal of the spark plug electrode wires.

Functioning of this new wire is described by Firestone as follows: From the polonium electrodes, alpha rays, most potent natural ionizing rays known to science, are constantly streaming out in all directions, accomplishing the breakdown (in the air gap) necessary to maintain the air in a condition conducive to instant sparking. While these rays are invisible, they are emitted continuously hour after hour throughout the life of the plug. The plugs have shown ability to start a car quicker, contribute to smoother, more economical performance, with the distinct advantage of increased acceleration.

With no attempt to belittle the development, metallurgists locally have been seen lifting their eyebrows slightly over some of the claims made for polonium. They say that polonium has a much shorter radioactive life than its associated element, radium, and at the same time is valued at $2,000,000 an ounce against $750,000 an ounce for radium, making the economies of the use of polonium perplexing.

Radium is formed by the disintegration of uranium, and in turn disintegrates into radon, radium A, B, C, C_1, D and E. From radium E comes polonium, although in working with radioactive ores, Madame Curie first discovered polonium and

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Power-Painting To Protect Wheels

■ **Power-painting of wheels, as practiced at the Dodge division of Chrysler Corp., Detroit, is designed to render wheels impervious to the action of water, mud and salt on winter highways. High-pressure sprays direct paint onto the revolving wheels so that both sides as well as the rim are given a smooth even coating**

was led to further research because the ore was still radioactive after separation of the polonium. The latter is sometimes referred to as radium F.

A prominent metallurgical laboratory here examined some of the polonium-bearing electrode wire in spectrographic equipment and reportedly was unable to detect any characteristic polonium lines in the resulting spectrum. Another means of detecting it would be by use of the electroscope which is highly sensitive to infinitesimal amounts of polonium. Encyclopedias mention that polonium in nature is closely associated with bismuth, and failure of the above spectrographic test may have been due to the operator's unfamiliarity with the metal's spectrum lines.

Chief source of polonium is a mine operated in the wilds of the Canadian northwest where pitchblende ore is extracted from the frigid earth. Shipped by airplane and dogsled to Waterways, Alberta, it is then sent by train to a refinery at Port Hope, Ont., where in some undisclosed way the polonium content is separated and shipped to Firestone which in turn sends it to the companies supplying electrode wire.

Electrode Material Varies

According to Firestone's description, "glass-lined steel tanks hold the steaming liquid with its precious polonium content. As needed, the polonium is mixed with the molten electrode material in the white heat of a high-frequency furnace." Electrode material is about 95 per cent nickel, with remainder varying according to specifications of different manufacturers. Some require manganese in limited amounts up to, say 4 per cent, with remainder of the analysis made up of tungsten, titanium, barium, zirconium, silicon, cobalt or aluminum or combinations. Traces of iron often are present, as well as around 0.1-0.2 per cent carbon. Most analyses are patented and their details are kept secret by the owners.

After melting in a high-frequency furnace, the metal is poured into small ingots, rolled into rods and then cold drawn into wire. Round wire for center electrodes ranges from 0.062-0.100-inch in diameter, and rectangular wire for the outer electrode ranges from 0.045 x 0.090 to 0.050 x 0.100-inch. Grain structure and temper of the wire are important qualifications in its use for spark plugs. Hoskins Mfg. Co. here supplies a large amount of spark plug electrode wire to plug manufacturers.

It is evident to investigators that a spark plug with the greatly improved radio-activity claimed for polonium would mean substantially reduced sizes and capacities of ignition equipment used in the present-day automobile.

■ BEYOND some additional truck business and a few small educational orders for armament material, the automobile and automobile parts industries have not been burdened with any excessive amount of demand, either from foreign combatants or from the military branches of the U. S. government. Within the past week or two, however, some important changes have come to light. Packard has received an order for engines to power super-high-speed torpedo boats for the navy department, amounting to some $2,000,000 and including a substantial amount for further engine experimentation.

A parts manufacturer here has been awarded government contract for about $600,000 worth of 81-millimeter shells, involving production procedure similar to that outlined in STEEL for March 11 and in use at Frankford arsenal. The shells being made here are forged from 10-inch steel rods 1¾ inches in diameter. They are heated in induction furnaces to avoid scaling, then are shaped in horizontal forging machines in seven steps. After forging they are cleaned, machined and painted inside and out with asphalt-base paint to protect against the formation of highly unstable gases from contact of the picric explosive with the exposed steel of the shell. Nose pieces and detonators are fitted on one end and thin-gage steel fins are spot welded to the other end. These shells do not have cases, being of the trench mortar type.

The 2000 trucks which Studebaker built for the French government last November and December accounted for less than 6 per cent of the period's unit sales of the corporation, and were sold at regular dealers' net prices.

Dodge truck division here has been busy on truck orders for foreign accounts, though no figures have been released as to numbers or sizes of trucks that are being assembled.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1938	1939	1940
Jan.	226,952	356,962	449,314
Feb.	202,597	317,520	.....
March	238,447	389,495	.....
April	237,929	354,266	.....
May	210,174	313,248	.....
June	189,402	324,253	.....
July	150,450	218,494	.....
Aug.	96,946	103,343	.....
Sept.	89,623	192,678	.....
Oct.	215,286	324,688	.....
Nov.	390,405	368,541	.....
Dec.	406,960	469,120	.....
Year	2,655,171	3,732,608	.....

Estimated by Ward's Reports

Week ended:	1940	1939†
Feb. 17	95,050	79,860
Feb. 24	102,570	75,660
Mar. 2	100,855	78,705
Mar. 9	103,560	84,095
Mar. 16	105,720	86,725

†Comparable week.

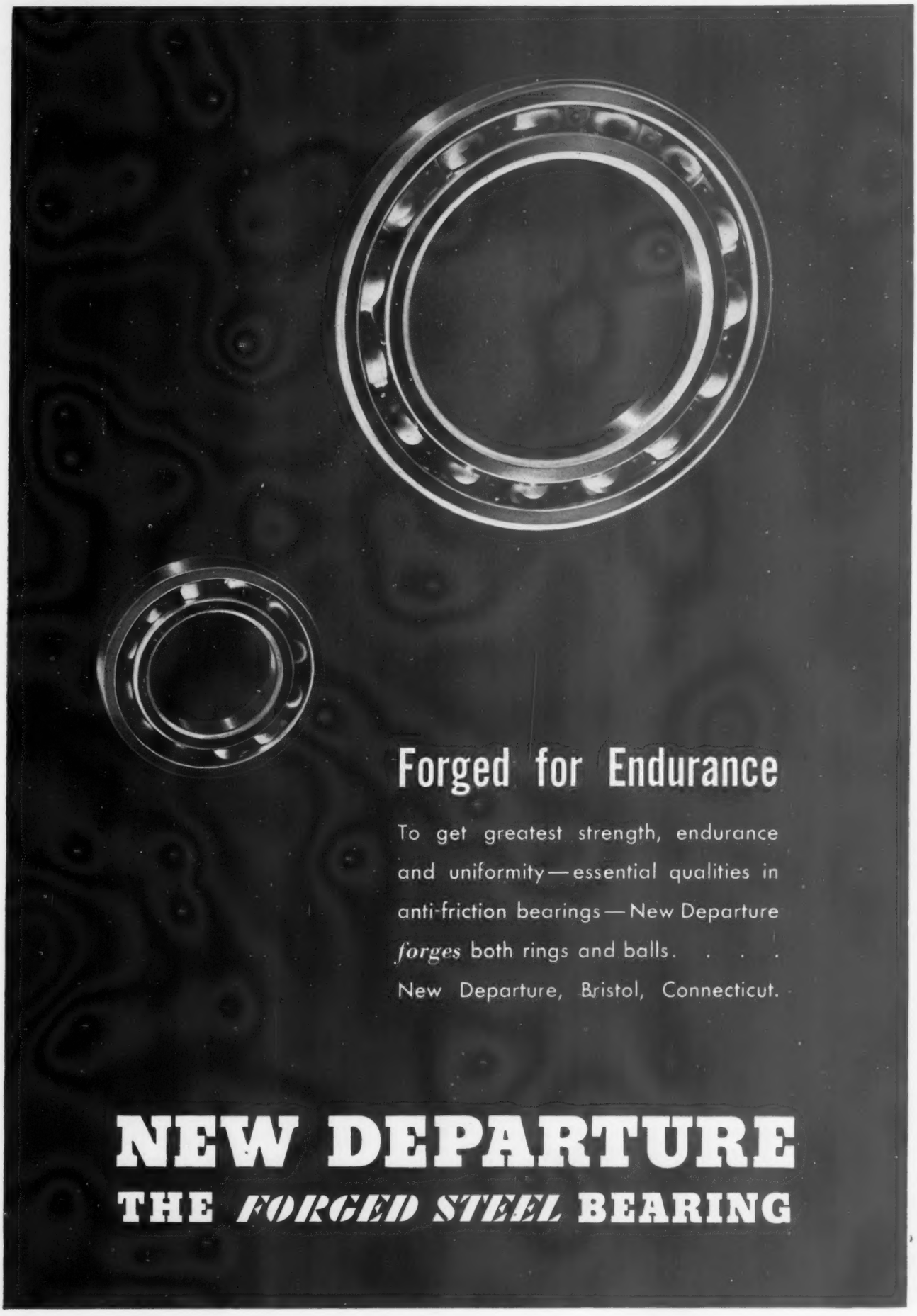
	Week ended Mar. 16	Mar. 9
General Motors	45,730	45,740
Chrysler	25,310	23,365
Ford	21,425	21,600
All others	13,255	12,855

■ THAT automobile air conditioning will be standard equipment, especially on cars shipped to the South, a good deal sooner than is anticipated is the prediction of Joe Askin, chief engineer, Fedders Mfg. Co. He points out several problems as yet unsolved in this equipment. For example, in changing car speed, how may the cooling capacity of the system be kept reasonably constant, since it is a known fact that the cooling requirements of the car certainly do not increase in proportion to the speed, whereas the capacity of the compressor does? Again when the engine is idling and the car is standing still it is always desirable to have sufficient capacity in the air conditioning system to take care of the cooling load on the car.

Units Hard to Locate

Location of the condenser needed in refrigerating equipment also has been a stickler. In some installations it has been placed directly above the windshield on top of the car; in others it has been placed directly in front of the radiator. Location of the compressor also is a difficult thing to decide, says Mr. Askin. Depending entirely upon available space under the hood, it usually may be operated by a V-belt connected to a pulley directly off the fanshaft.

Engineers are reported to be looking into the matter of aluminum for automotive wheels, as a means of reducing unsprung weight and improving riding qualities. Airplane landing wheels of aluminum, cast in sand and in permanent molds, have been in use for some time and it is claimed possible to produce satisfactory disk wheels of aluminum with aluminum brake drums having iron liners shrunk and bolted in place, and save around 40 per cent in unsprung weight as compared with the same parts made of steel.


Forged for Endurance
To get greatest strength, endurance and uniformity—essential qualities in anti-friction bearings—New Departure *forges* both rings and balls. . . . New Departure, Bristol, Connecticut.
NEW DEPARTURE
THE *FORGED STEEL* BEARING

EDITORIAL

The Republican Platform

■ MANY business men who have not already done so will want to peruse carefully the statement of principles of the Republican program committee of which Glenn Frank is chairman. Copies may be obtained free from the Republican national committee, 718 Jackson place, N. W., Washington.

Under the title "A Program for a Dynamic America," the statement examines American policies in government, toward the European war, foreign relations, labor, the farmer and business. It discusses government spending and taxes, government competition and interference with business and it makes recommendations which—provided that they are embraced by the Republican party as a whole—should go far to dismiss fears as to what that party has to offer to the country in this presidential election year.

Regulation May Cause Unintended Results Destructive to Industry

From the standpoint of business its conclusions are of a character that should appeal to the thinking business man. From the statement can be culled many thoughtful observations such as the following:

"When the hand of government touches the economic mechanism at any point it may produce effects, wholly unexpected and sometimes disastrous, at points far removed from the original point of contact. The unplanned results of planning or regulation are often as significant, for good or for ill, as the intended results.

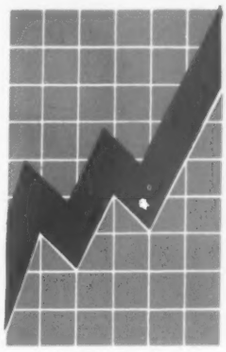
"For example, the purpose of the securities act of 1933, in providing protection to investors by requiring a full disclosure of all material facts in connection with the issuance and sale of securities, is as vital as protecting consumers against adulterated or poisonous foods. But the requirement of voluminous information, drastic liabilities for non-compliance, and costs that are often prohibitive to the organization and financing of relatively small enterprise have played a large part in obstructing the investment and reinvestment of funds essential to recovery. This secondary result of the securities act may well be as important as its primary purposes. Such a result is in no way an inevitable effect of an adequate and properly administered federal securities law."

Clearcut Issues Demand Active Interest in National Platforms

The statement of Republican principles takes the ground that the nation's plant is underbuilt, that we have more fruitful frontiers than ever, that expansion is possible if we do not block it and that we need to revitalize the unique creative power of political liberty and private enterprise in combination. It stresses that regulation of business must be intelligent and friendly.

The platform of the opponents to the present regime is of vital concern to business since a third term could be expected to bring an intensification rather than an amelioration of government controls that stifle individual initiative. This is one presidential election year when the business man cannot afford to be indifferent or lukewarm in the matter of politics.

The *BUSINESS TREND*

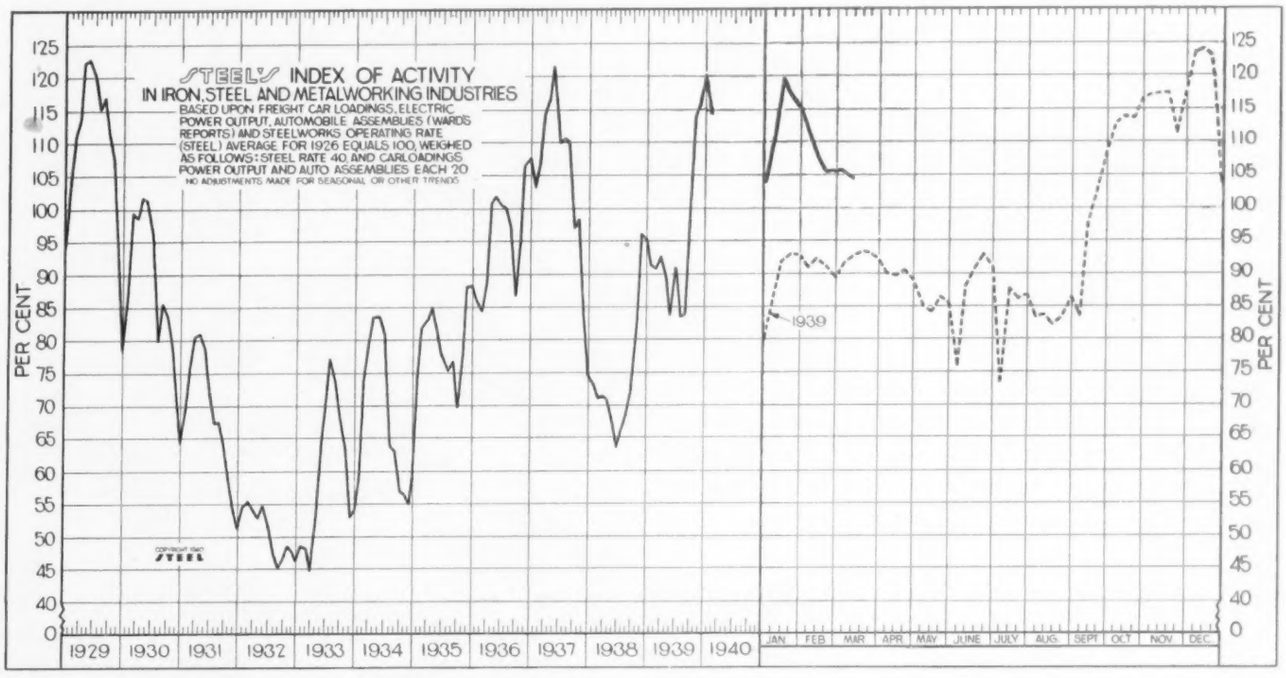


Industrial Indicators Are Developing Mixed Trends

■ OFFSETTING the encouraging gain in automobile production during the week ended March 9, were declines in steelmaking operations, revenue freight carloadings and electric power consumption. However, mixed trends are developing among most industrial indicators, in contrast with the broad downward movement recorded throughout January and most of February.

The slight improvement in STEEL'S index of activity during the weeks ended Feb. 24 and March 2 proved short-lived. For the week ended March 9, the index declined 0.9 point to 104.7. This represents the lowest level recorded by the index this year, but it remains well above 92.7 registered in the corresponding period a year ago. In the same 1938 week the index stood at 70.8.

Automotive industry is furnishing a substantial support to industrial activity. Assemblies during the week ended March 9 recorded a moderate increase to 103,560 units, and first quarter output is expected to reach the highest level of any comparable quarter since 1929, with the possible exception of the initial 1937 period. Despite active operations in recent weeks, order backlogs remain large.


STEEL'S INDEX OF ACTIVITY
IN IRON, STEEL AND METALWORKING INDUSTRIES
BASED UPON FREIGHT CAR LOADINGS, ELECTRIC POWER OUTPUT, AUTOMOBILE ASSEMBLIES (WARDS REPORTS) AND STEELWORKS OPERATING RATE (STEEL) AVERAGE FOR 1926 EQUALS 100, WEIGHED AS FOLLOWS: STEEL RATE 40, AND CARLOADINGS, POWER OUTPUT AND AUTO ASSEMBLIES EACH 20
NO ADJUSTMENTS MADE FOR SEASONAL OR OTHER TRENDS
PER CENT
1939
1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

STEEL'S index of activity declined 0.9 point to 104.7 in the week ended March 9:

Week Ended	1940	1939
Jan. 6	110.3	86.5
Jan. 13	119.2	91.9
Jan. 20	117.3	93.0
Jan. 27	115.4	92.9
Feb. 3	111.6	90.7
Feb. 10	107.2	92.1
Feb. 17	105.1	91.1
Feb. 24	105.4	89.3
Mar. 2	105.6	91.5
Mar. 9	104.7	92.7

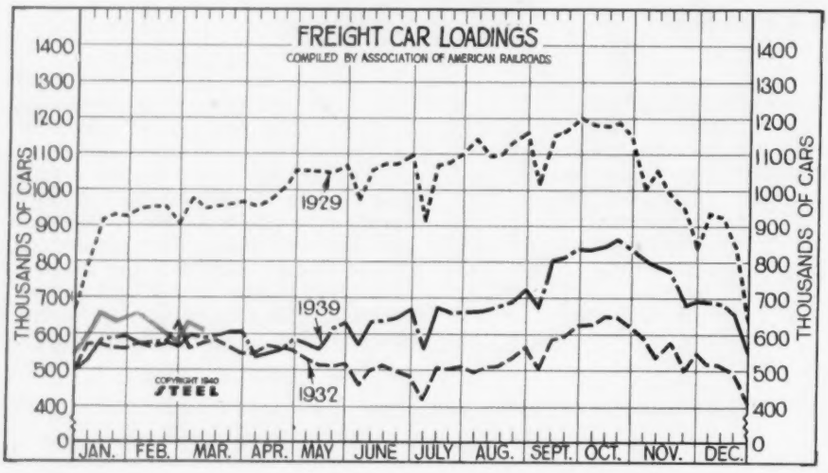
Mo. Data	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	114.7	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	105.8	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	.....	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	.....	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	.....	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	.....	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	.....	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	.....	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	.....	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	.....	114.0	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	.....	116.2	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	....	118.9	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

Steel Ingot Operations

(Per Cent)

Week ended	1939	1938	1937
Dec. 9	94.0	61.0	27.0
Dec. 16	92.5	58.0	27.0
Dec. 23	90.5	52.0	23.0
Dec. 30	75.5	40.0	21.0

Week ended	1940	1939	1938	1937
Jan. 6	86.5	51.5	26.0	79.5
Jan. 13	86.0	52.0	29.0	79.0
Jan. 20	84.5	51.5	30.5	80.0
Jan. 27	81.5	51.5	33.0	76.0
Feb. 3	76.5	53.0	31.0	79.5
Feb. 10	71.0	54.0	30.0	81.0
Feb. 17	69.0	55.0	31.0	83.0
Feb. 24	67.0	55.0	30.5	84.0
Mar. 2	65.5	56.0	29.5	86.0
Mar. 9	63.5	56.5	30.0	87.0



Freight Car Loadings

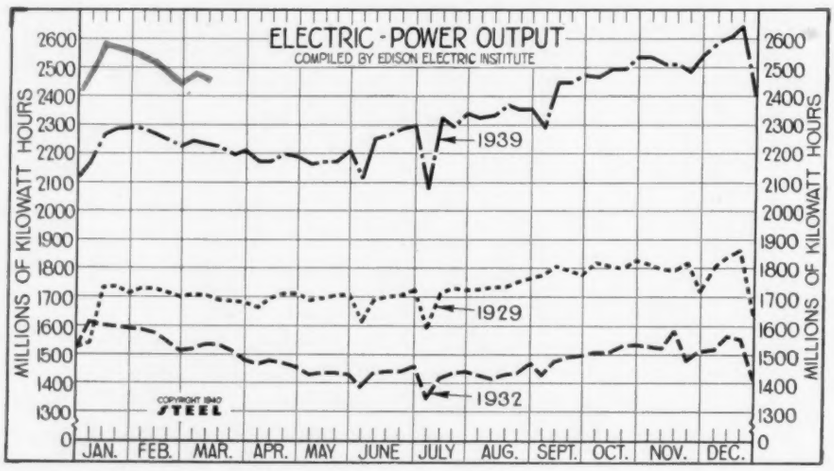
(1000 Cars)

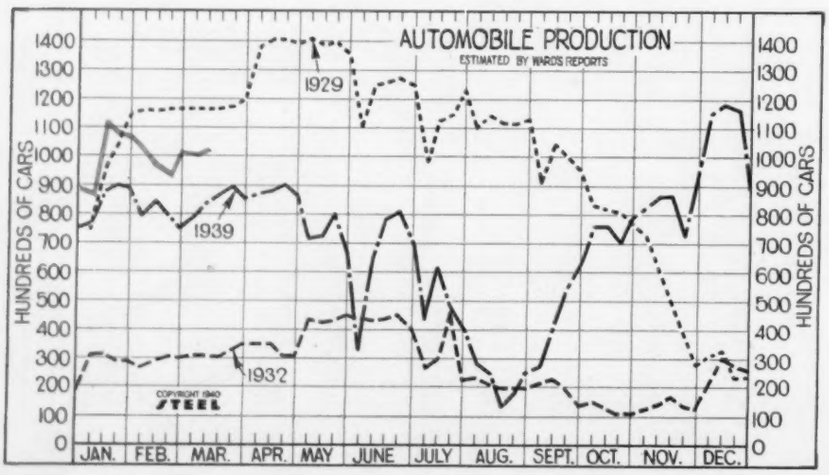
Week ended	1940	1939	1938	1937
Dec. 9		687	619	622
Dec. 16		681	606	603
Dec. 23		655	574	460
Dec. 30		550	500	457
Jan. 6	592	531	552	699
Jan. 13	668	587	581	700
Jan. 20	646	590	570	670
Jan. 27	650	594	553	660
Feb. 3	553	577	565	675
Feb. 10	627	580	543	692
Feb. 17	608	580	536	715
Feb. 24	595	561	512	697
Mar. 2	634	599	553	734
Mar. 9	621	592	557	749

Electric Power Output

(Million KWH)

Week ended	1940	1939	1938	1937
Dec. 9		2,586	2,319	2,196
Dec. 16		2,605	2,333	2,202
Dec. 23		2,641	2,363	2,085
Dec. 30		2,404	2,121	1,998
Jan. 6	2,473	2,169	2,140	2,244
Jan. 13	2,593	2,270	2,115	2,264
Jan. 20	2,572	2,290	2,109	2,257
Jan. 13	2,566	2,293	2,099	2,215
Feb. 3	2,541	2,287	2,082	2,201
Feb. 10	2,523	2,268	2,052	2,200
Feb. 17	2,476	2,249	2,059	2,212
Feb. 24	2,455	2,226	2,031	2,207
Mar. 2	2,479	2,244	2,036	2,200
Mar. 9	2,464	2,238	2,015	2,213

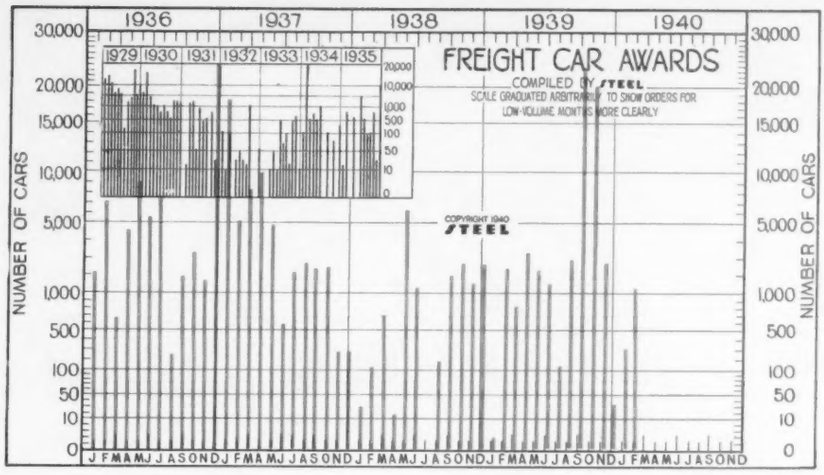




Auto Production

(1000 Units)

Week ended	1940	1939	1938	1937
Dec. 9		115.5	100.7	85.8
Dec. 16		118.4	102.9	82.0
Dec. 23		117.7	92.9	67.2
Dec. 30		89.4	75.2	49.6
Jan. 6	87.5	76.7	54.1	96.8
Jan. 13	111.3	86.9	65.7	91.7
Jan. 20	108.5	90.2	65.4	81.4
Jan. 27	106.4	89.2	59.4	74.1
Feb. 3	101.2	79.4	51.4	72.3
Feb. 10	96.0	84.5	57.8	72.8
Feb. 17	95.1	79.9	59.1	95.7
Feb. 24	102.6	75.7	57.0	111.9
Mar. 2	100.9	78.7	54.4	127.0
Mar. 9	103.6	84.1	57.4	101.7


1936
1937
1938
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FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW-VOLUME MONTHS MORE CLEARLY
COPYRIGHT 1940 STEEL
NUMBER OF CARS
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Freight Car Awards

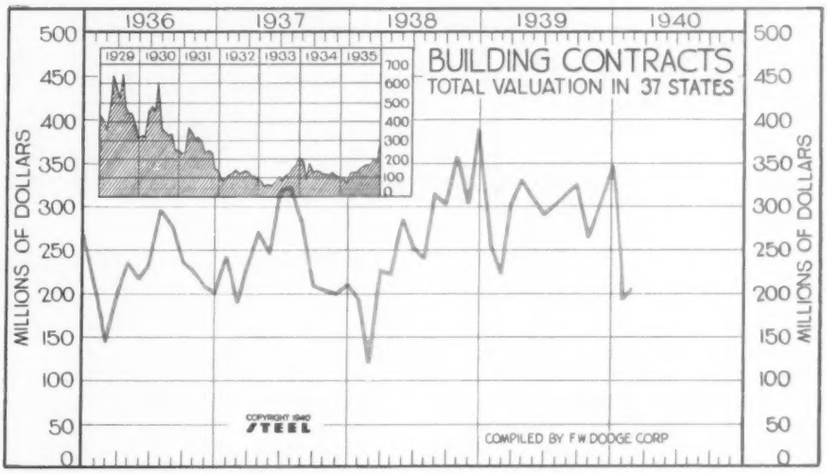
(Hundreds of Cars)

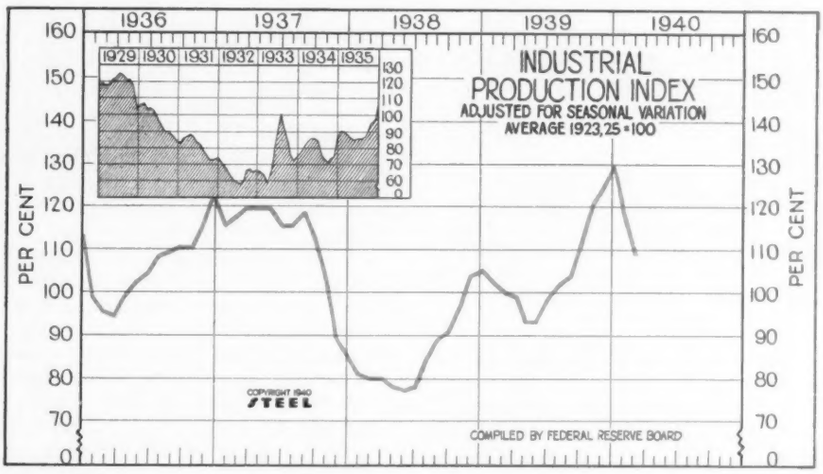
	1940	1939	1938	1937
Jan.	3.60	.03	.25	178.06
Feb.	11.47	22.59	1.09	49.72
Mar.	.....	8.00	6.80	81.55
April	.....	30.95	.15	97.72
May	.....	20.51	60.14	47.32
June	.....	13.24	11.78	5.48
July	.....	1.10	.00	10.30
Aug.	.....	28.14	1.82	14.75
Sept.	.....	230.00	17.50	12.16
Oct.	.....	196.34	25.37	13.55
Nov.	.....	26.50	12.32	2.75
Dec.	.....	.35	25.81	2.75
Total	.....	577.75	163.03	516.11

Construction Total Valuation In 37 States

(Unit: $1,000,000)

	1940	1939	1938	1937	1936
Jan.	$196.2	$251.7	$192.2	$242.7	$204.8
Feb.	200.6	220.2	118.9	188.3	142.1
Mar.	.....	300.7	226.6	231.2	199.0
April	.....	330.0	222.0	269.5	234.8
May	.....	308.5	283.2	243.7	216.1
June	.....	288.3	251.0	317.7	232.7
July	.....	299.9	239.8	321.6	294.7
Aug.	.....	312.3	313.1	281.2	275.3
Sept.	.....	323.2	300.9	207.1	234.3
Oct.	.....	261.8	357.7	202.1	225.8
Nov.	.....	299.8	301.7	198.4	208.2
Dec.	.....	354.1	389.4	209.5	199.7
Ave.	.....	$295.9	$266.4	$242.8	$222.3





Industrial Production
Federal Reserve Board's Index

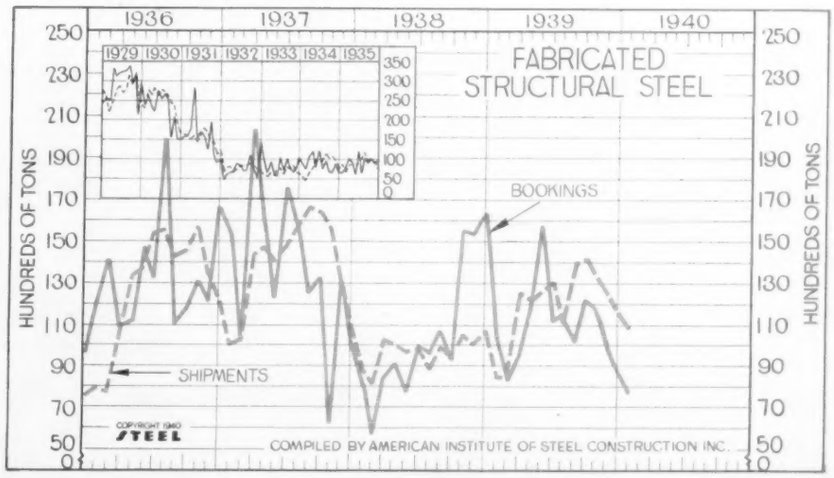
(1923-25 = 100)

	1940	1939	1938	1937	1936
Jan.	119	101	80	114	98
Feb.	109	99	79	116	94
Mar.	...	98	79	118	93
April	...	92	77	118	98
May	...	92	76	118	101
June	...	98	77	114	103
July	...	101	83	114	107
Aug.	...	103	88	117	108
Sept.	...	111	90	111	109
Oct.	...	120	96	102	109
Nov.	...	124	103	88	114
Dec.	...	128	104	84	121
Ave.	...	106	86	110	105

Fabricated Structural Steel

(1000 tons)

	Shipments			Bookings		
	1940	1939	1938	1940	1939	1938
Jan.	107.6	84.3	87.8	75.8	101.7	80.3
Feb.	.....	84.4	81.2	....	82.7	57.1
Mar.	.....	125.3	103.3	....	95.1	84.3
Apr.	.....	120.9	100.0	....	118.3	91.2
May	.....	125.9	96.4	....	156.9	77.3
June	.....	130.1	98.6	....	111.6	99.9
July	.....	110.5	88.0	....	114.1	96.0
Aug.	.....	139.7	98.6	....	100.9	106.8
Sept.	.....	140.8	93.5	....	121.4	92.5
Oct.	.....	133.8	105.0	....	118.8	154.8
Nov.	.....	128.2	99.9	....	99.3	153.1
Dec.	.....	116.2	106.5	....	84.4	163.4
Total	....	1440.1	1158.8	....	1305.0	1256.6



By J. N. CROMBIE
Carnegie-Illinois Steel Corp.
Chicago

How to Anneal For Superior

For mild subsequent draws, investigations show annealing temperature below 1100 degrees Fahr. is best. Where metal is to be worked severely, annealing temperatures should be from 1650 to 1700 degrees

■ ALTHOUGH improved steels have made it possible to eliminate much annealing formerly necessary between draws, many severely drawn articles still require an intermediate anneal. Detailed here are results of a study to determine optimum annealing temperatures that will provide maximum drawing qualities for subsequent operations.

Extensive investigations have shown there are three general distinguishable steps or processes in annealing:

Stress Relief. At relatively low annealing temperatures, internal stresses from cold working are released. Strength and ductility are not appreciably changed yet the stress-relieved article is less subject to fracture in subsequent forming because internal stresses are eliminated.

Recrystallization. When a cold-worked metal is heated to certain temperatures higher than required for stress relief, new grains form and grow until an entirely new grain structure is developed. Properties are changed radically. The metal becomes noticeably softer.

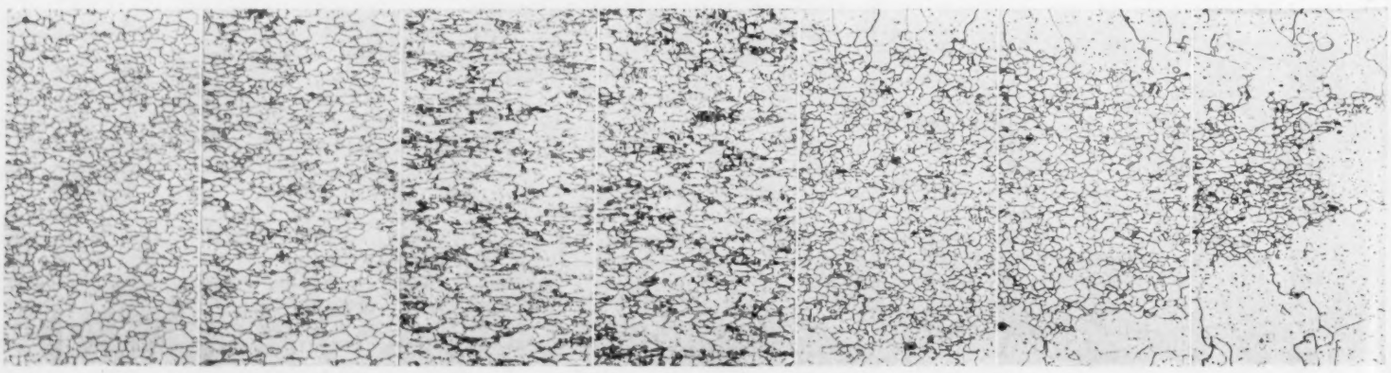
Grain Growth. As time is increased for a particular temperature or as temperature alone is increased, the recrystallized grains will increase in size. However, this generally occurs when periods are far greater than ordinarily used for intermediate annealing of hollow ware.

Well recognized laws governing recrystallization include: The greater the degree of cold work, the lower the temperature required for recrystallization. . . . Increased length of anneal lowers the temperature at which recrystallization will occur. . . . The larger the original grain size, the greater the amount of cold work required to give an equivalent recrystallization temperature. . . . Final grain size depends more on the degree of cold work than on the annealing temperature. . . . While there are other generalities, these four are of most interest. The last is of utmost importance.

Mild steel strained to values of deformation within certain limits, then annealed in a certain range of temperature, develops a condition of exaggerated grain growth. This region of deformation has been defined as that of "critical strain". That it occurs in a relatively clearly defined range of strain and annealing temperatures has been shown by many investigators.

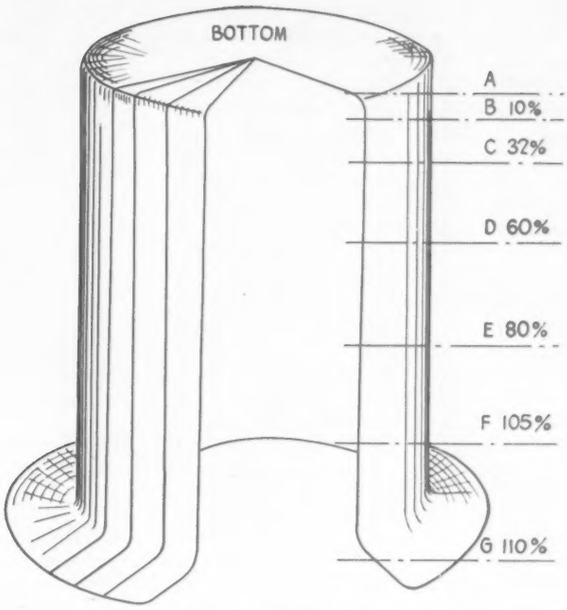
Critical grain growth is of great importance in the intermediate annealing of drawn hollow ware. Abnormally large grains are relatively weak and when present in steel subjected to drawing are extremely likely to fracture. On any drawn article there is a gradient of strain or cold work from zero up to a large amount. Since certain sections

From paper presented at fourth annual forum of Porcelain Enamel institute, held at Ohio State university, Columbus, O.



From left to right. Fig. 1—Original shell. Fig. 2—Drawn at point C. Fig. 3—Drawn at G. Fig. 4—Drawn at flange Fig. 5—Specimen taken from bottom, annealed at 1200 degrees for 2 minutes. Figs. 6 and 7 taken from points near radius, same anneal as Fig. 5

Drawing Qualities



Strips were taken from the drawn vessel as shown in this diagram

will be in the range of "critical strain" it is obvious that annealing temperatures must be controlled to avoid development of abnormally large grains and their attendant lack of ductility.

Some tests to demonstrate this phenomenon of critical grain growth were conducted on a drawn shell of cold-reduced steel for porcelain enameling. Analysis of the material showed carbon 0.06 per cent, manganese 0.33 per cent, phosphorus 0.009 per cent, sulphur 0.026 per cent, silicon 0.008 per cent—a typical enameling steel. Shells were drawn from blanks, 20½ inches in diameter and 0.024-inch thick, to a diameter of 8 inches and a depth of 9¼ inches in four operations without intermediate anneal. An estimate of amount of cold work in various portions of the shells was obtained by scribing 1-inch squares on the original blanks and measuring the distortion of these squares after the four drawing operations.

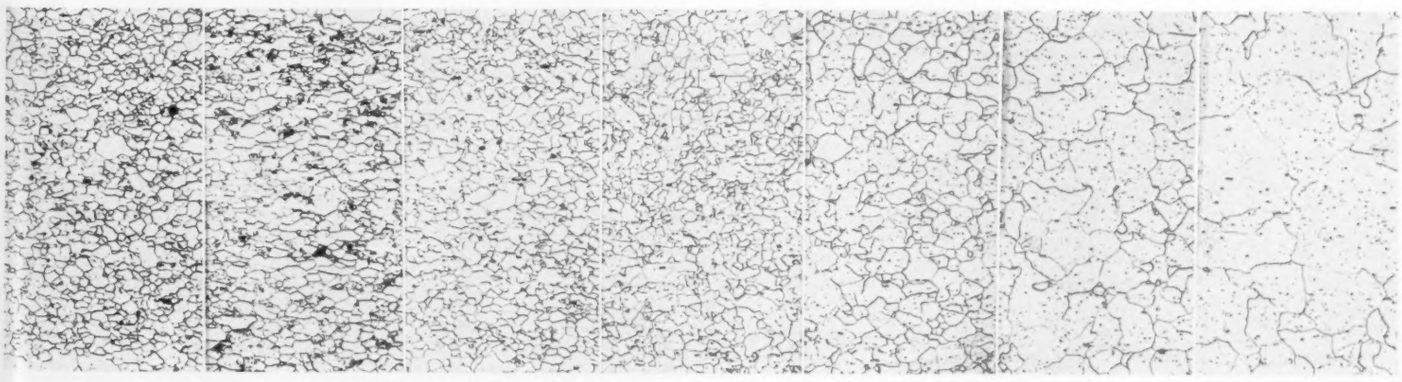
Strips, 1-inch wide, each representing the full range of deformation, were cut vertically from a shell. Separate strips were annealed at temperatures of 1000, 1050, 1100, 1200, 1300, 1400, 1500, 1600 and 1700 degrees Fahr. maintaining them at the respective temperatures for 2 minutes. Annealing, as well as other tests described later, was conducted in a manner simulating shop practice. Specimens were placed in a furnace slightly above desired temperature. After temperature was reached, they were held there for 2 minutes and cooled in air. It required about 6 minutes to reach temperature, increasing slightly to 7 minutes at the higher temperatures of 1600 and 1700 degrees Fahr. Although this length of time is slightly greater than usual in annealing hollow ware in the shop, this method was adopted to obtain greater accuracy in final temperature.

Specimens for metallographic examination were taken from these strips at bottom of shell, at radius and continuously up to and including flange at top. Above shows manner in which the strip samples were taken and also lists elongations observed. Note it is only around the radius at bottom of shell that little elongation occurs, important in subsequent annealing results.

Micrograph, Fig. 1, shows initial grain structure of original material on bottom of shell and at section B. Elongation of grains is not obvious under a microscope unless the steel is elongated 15 per cent or more. In Fig. 3, distortion at G is seen to be quite severe. Typical structure of flange material is shown in Fig. 4.

Study of specimens similar to these four but annealed at 1000, 1050 and 1100 degrees Fahr. for 2 minutes showed no change in microstructure. This supports the

Fig. 8—Also near radius B. Fig. 9—At point C. Fig. 10—At point D. Fig. 11—At point G. Fig. 12—Original unstrained material. Fig. 13—Elongated 20 per cent, annealed at 1100 degrees, 2 minutes. Fig. 14—Elongated 5 per cent, annealed at 1200 degrees



previous statement that result of low-temperature annealing was not evident in the microstructure.

Similar strips annealed at 1200 degrees Fahr. for 2 minutes, however, reveal a radical change. In Fig. 5, at A on shell bottom not far from radius, considerable grain enlargement has occurred near the surface. Figs. 6, 7 and 8 were taken at radius near B, Fig. 6 nearest bottom, Fig. 7 about the middle of the radius, while Fig. 8 is around the radius at side of shell. Note large size of grains as compared to original material, Fig. 1.

Figs. 5, 6, 7 and 8 represent a series of slightly increasing strain, total range of extension being about 10 per cent. This demonstrates clearly the wide change in structure which results from only minor differences in strain.

Structures Similar in Strips

Fig. 9 shows microstructure at C, about 2 inches from shell bottom. Note grains are larger than initial structure but much smaller than largest grains in Fig. 8. Fig. 10, from section D, shows still smaller grain structure. Fig. 11, from section G, reveals smaller grains, not much different from original material. Flange shows same structure.

Similar though not same structures were formed in strips annealed at 1300, 1400 and 1500 degrees Fahr. for 2 minutes, but changes are again observed at 1600 and 1700 degrees Fahr. These, however, are not shown as they closely parallel a later series of tests.

Results just described show roughly the deformation involved when exaggerated grain growth is developed.

To define this range more exactly, specimens were pulled in a tensile testing machine to various definite percentages of elongation from 5 to 25 per cent and annealed simultaneously with test strips from drawn shell to duplicate heat treatment.

Fig. 12 shows original unstrained material. All specimens strained up to 15 per cent but not annealed

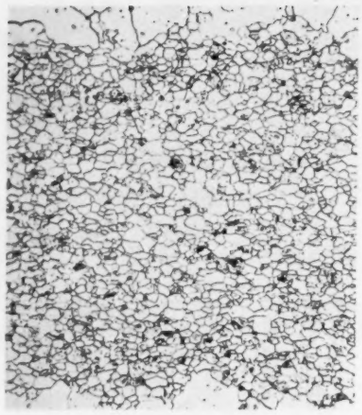


Fig. 15—Elongated 7.5 per cent, annealed at 1200 degrees

exhibited a like structure. These also did not show any change in structure when annealed at 1000, 1050 and 1100 degrees Fahr. for 2 minutes.

Fig. 13 is a specimen having 20 per cent elongation, annealed at 1100 degrees for 2 minutes. It illustrates elongation of grains under heavy strain (considerable stretch) as well as lack of change in structure. A specimen elongated 25 per cent gave similar results.

Marked Change at Higher Heat

Annealing at 1200 degrees was found to change the structure markedly. Specimen in Fig. 14 was elongated 5 per cent. Note beginning of formation of larger grains at surface. In Fig. 15, elongated 7 per cent, grains again are noticeably larger. Fig. 16 was with 10 per cent elongation. Fig. 17, 15 per cent elongation, shows small grains have disappeared. In Fig. 18 and 19 with 20 and 25 per cent elongation, original grain structure has been completely recrystallized.

Next micrographs illustrate material annealed at 1300 degrees Fahr. for 2 minutes. In Fig. 20, elongated 5 per cent, note enlargement of grains is more pronounced than those annealed at 1200 degrees. In Figs. 21 and 22, elongated 7.5 per cent and 10 per cent, extremely large grains have developed in both cases.

Fig. 23, elongated 15 per cent, shows a grain size somewhat smaller. It is still smaller in next picture, Fig. 24, elongated 20 per cent, Fig. 25, elongated 25 per cent, has still smaller grains. Specimens annealed at 1400 and 1500 degrees Fahr. were similar to those annealed at 1300 degrees Fahr., so are omitted.

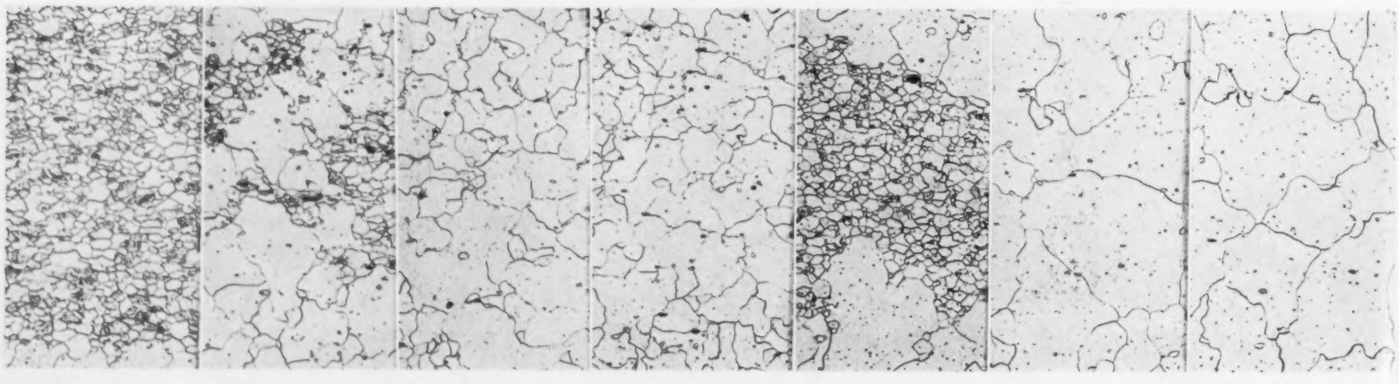
At 1600 degrees Fahr., however, there is a noticeable decrease in the number of the exceedingly large grains, Fig. 26. While some fairly large ones were observed, all specimens showed a distinct trend to smaller sized grains.

At 1700 degrees Fahr. another marked change is seen. Grain size in all specimens was uniform. Although larger than original steel, it is much smaller than abnormally large ones previously exhibited. Fig. 27 shows a representative structure of this 1700-degree series.

Effect of increased annealing time also was investigated. Since it is not common to anneal hollow ware any considerable time, experimental tests were limited to three temperatures—1100, 1400 and 1700 degrees Fahr. for 5 and 10 minutes at temperature. Results differed little from those with 2-minute anneal. No change in structure was observed at 1100 degrees Fahr. At 1400 degrees there was a slight increase in grain size or a greater proportion of larger grains as shown by Fig. 28, elongated 5 per cent and annealed 2 minutes at 1400 degrees Fahr., and Fig. 29, same except annealed 10 minutes.

Summary: Results of tests on specimen elongated by tension and annealed for 2 minutes are disclosed

Fig. 16—Elongated 10 per cent, annealed at 1200. Fig. 17—At 15 per cent elongation, same anneal. Fig. 18—At 20 per cent, same anneal. Fig. 19—At 25 per cent, same anneal. Fig. 20—Anneal changed to 1300 degrees, 2 minutes. Elongation 5 per cent. Fig. 21—Elongation at 7.5 per cent, same anneal. Fig. 22—Elongated 10 per cent with same anneal



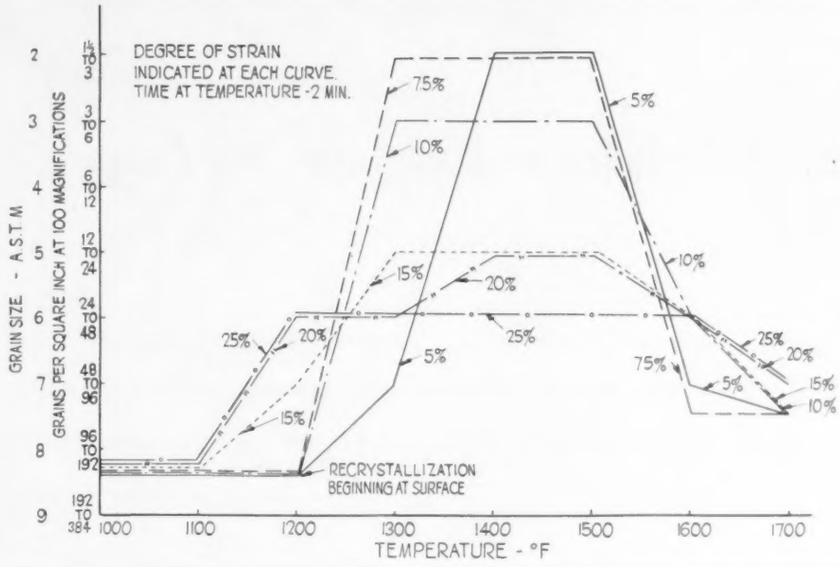


Chart shows region of "critical grain growth" vividly. For elongations of 5, 7.5 and 10 per cent, grains grow much larger than for elongations of 15 per cent and more, regardless of annealing temperatures up to 1600 degrees Fahr.

in accompanying chart. Grain size is plotted against temperature of anneal for each degree of straining (stretch). Grain size customarily is denoted by numbers which classify grain size by number of grains per square inch at a magnification of 100 diameters. Grain count represents approximate sizes only. Such a count of course is conditioned upon selecting a truly representative area. This is no easy matter with grains varying widely. However, every effort was made to select representative areas so curves represent true conditions as nearly as possible. Grain number designated is grain size classification recommended by American Society of Testing Materials.

Chart shows region of "critical grain growth" vividly. Note that for elongations of 5, 7.5 and 10 per cent, grains grow much larger than those strained 15 per cent or more, regardless of annealing temperatures up to 1600 degrees Fahr.

Two laws of recrystallization are illustrated clearly. The greater the degree of cold work, the lower the temperature for recrystallization; and final grain size depends more upon degree of cold work than upon annealing temperature — at least up to 1600 degrees Fahr. This type of enameling steel has a transformation point, A3 point, at about 1625 degrees Fahr. At this temperature, the steel undergoes a complete change in structure regardless of previous condition or treatment. The atoms themselves undergo a change in arrangement and the structure becomes uniform throughout upon cooling when the steel is said to be normalized. Such a structure, Fig. 27, gives good drawing qualities.

Conclusions: As regards annealing of drawn hollow ware and results to be expected in subsequent drawing, several features should be borne in mind. As previously pointed out, practically every drawn article has certain locations or areas which have been cold worked within the critical region of 5 to 15 per cent. Abnormally large grained steel is known to be weak. Also it is generally recognized that steel having a wide range of grain sizes is also weak.

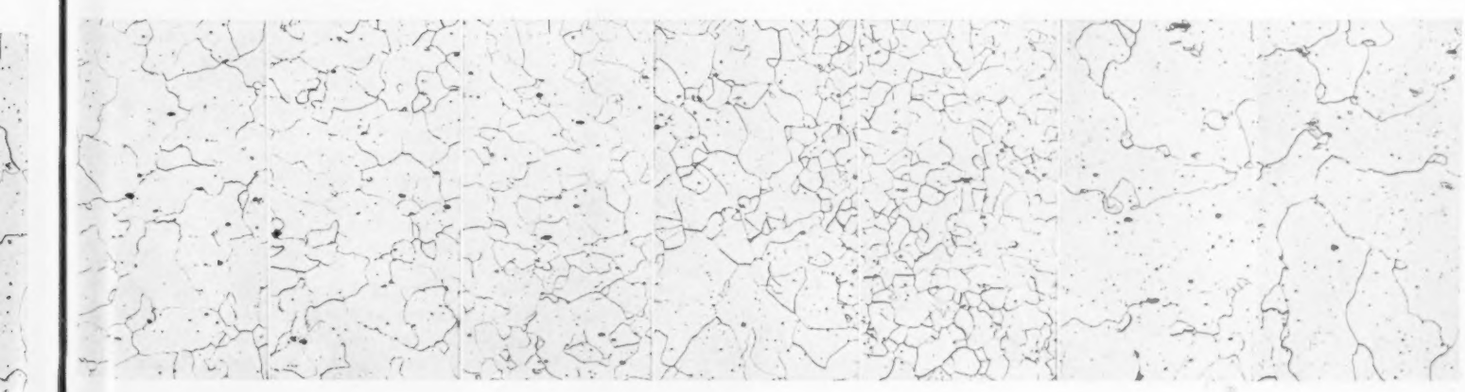
Thus that portion of the drawn article having the critical degree of strain is subject to critical grain growth and quite frequently is most severely drawn in succeeding operations.

Two alternatives may be taken. The first is to anneal below 1100 degrees Fahr. under which condition drawing strains are relieved and satisfactory results obtained provided subsequent operations are mild. If the succeeding draws are severe, annealing should be conducted above the transformation temperature at 1650 to 1700 degrees Fahr.

These are temperatures of the steel and not furnace temperatures. Most hollow ware is annealed in a traveling furnace and actual temperature of the ware is dependent not only upon furnace temperature but also upon rate of travel through furnace. Furthermore, for a given speed and temperature, the quantity of material put through the furnace may influence the final results as this also may affect furnace temperature. No doubt this influence is small since ordinarily weight of ware in furnace is relatively small. However, it may be a larger factor if operations are intermittent or batches are not followed up closely.

Experience will quickly reveal whether or not annealing temperature is correct. A wrong temperature can frequently be detected by visual examination of a broken article. Surface near the fracture will often show a noticeably coarse appearance if the ware has been annealed within the range of critical grain growth.

Fig. 23—Elongation increased to 15 per cent, same anneal. Fig. 24—Elongation 20 per cent. Fig. 25—Elongated 25 per cent. Fig. 26—At 1600 degrees, elongation 15 per cent. Fig. 27—At 1700 degrees, elongation 10 per cent. Figs. 28 and 29 were both at 1400 degrees, 5 per cent elongation, but Fig. 28 annealed 2 minutes, Fig. 29 annealed 10 minutes



New Slabber-Edger Setup

Slabbing, edging stands are separated. Tapered rolls on turnaround tables speed handling. Ingots rolled broadside. Machine flame scarfing employed, 80-inch hot strip mill modernized, other changes made

■ AT EAST works of American Rolling Mill Co., Middletown, O., a new 72-inch reversing slabbing mill of rather unusual design recently replaced an old blooming mill. This new installation, together with revamping the existing 80-inch continuous hot-strip mill was final step in a modernization and improvement program started in 1937.

These modernizations permit rolling larger ingots and use of longer, heavier slabs. An 8½-ton ingot now can be rolled into a single coil without cutting or reheating (except in holding furnaces). Result is a product of improved quality. Coils now may be rolled up to a maximum of 16,500 pounds. No changes were made in open-hearth department.

However, the six rows of soaking pits, four per row, at left in Fig. 3 now are augmented by an additional row of four at the north end of this room. The new soaking pits are of a different type and larger.

Ingot chariot, traveling lengthwise the soaking pit room on the side adjoining the mill, was revamped to take the ingots set on end by the crane and tilt them over on their sides. Previously ingots were fed to the blooming mill on edge. Now all ingots are delivered and worked in a flat position.

Ingot sizes with the old arrangement were 18 x 39 x 69 inches high and 20 x 42 x 69 inches high. Now the smaller of these two sizes has been entirely discontinued and four larger sizes added, all 20 inches thick and 69 inches high but varying to include widths of 30, 36, 50 and 57 inches.

Mill approach tables 1 and 2, Fig. 3, were taken from the old mill and revamped for use here. An ingot turnover was added on the approach side at table 2.

Slabber and Edger Separated

Slabber and edger units are all new equipment except the screwdowns and shoes. Instead of edging and rolling on one mill as done in universal slabbers, the slabber and edger are separate stands separated 33 feet as shown in Figs. 1 and 3. Slabber rolls, 45 x 120 inches, are direct connected to two 5000-horsepower direct-current motors, Fig. 6, operating at 40 to 80 revolutions per minute in the adjoining motor room. This 72-inch slabbing mill is said to be the first of its kind to roll slabs over 60 inches wide suitable for further reduction to strip.

Water-lubricated synthetic bearings are used on main rolls of slabber and on the two sets of feed rolls on each side of this mill. Edger is equipped with babbitt bearings. High-pressure hand grease system lubricates approach tables. An automatic grease system serves the babbitt bearings of the edger with

Fig. 1—New slabber at right, edger off to extreme left, control pulpit at upper left. Operators are protected from radiated heat by heat-absorbing glass

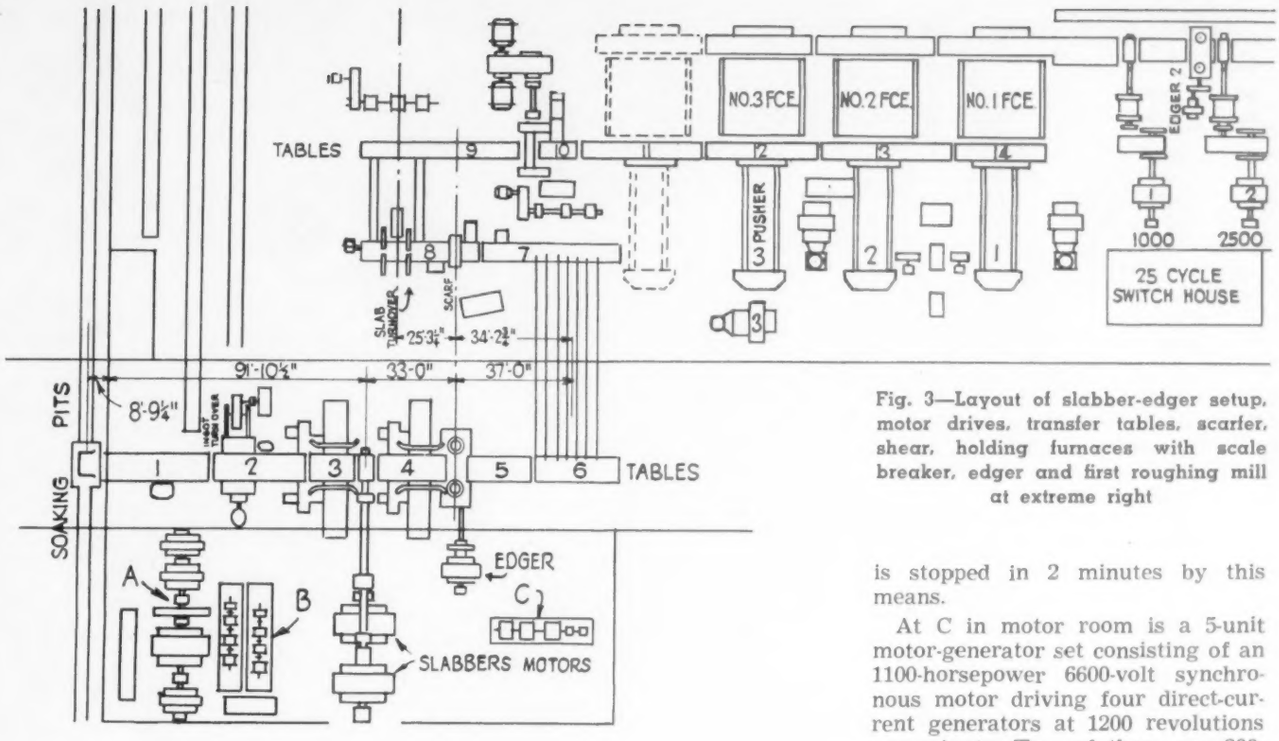


Fig. 3—Layout of slabber-edger setup, motor drives, transfer tables, scarfer, shear, holding furnaces with scale breaker, edger and first roughing mill at extreme right

an automatic circulating oil system on the edger gears.

Vertical edger rolls are 40 inches in diameter. Edger handles maximum width of 76 inches and is driven by a 2000-horsepower direct-current motor at 100 to 200 revolutions per minute.

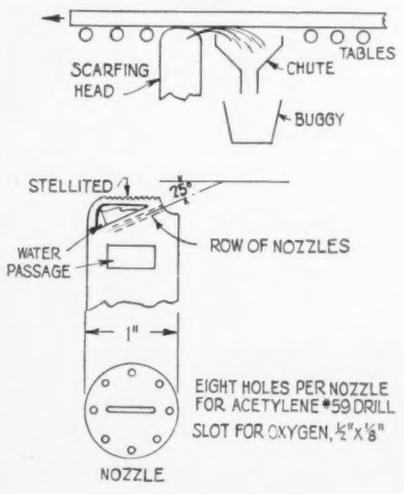


Fig. 2—Details of scarfer

Large motor-generator set in motor room at A, Fig. 3, furnishes power for both slabber and edger motors. Shown in Fig. 7, it consists of a 7000-horsepower 6600-volt slip-ring induction motor with synchronous speed of 360 revolutions per minute driving a 100-ton flywheel and three 3000-kilowatt 700-volt direct-current generators which are paralleled and interconnected with cumulative fields.

A unique feature of the control equipment is the automatic adjusting of the excitation for the slabber and edger motors. When an ingot is being rolled in the slabber, edger excitation automatically is set to run the edger at base speed. Similarly, when the edger is being operated, slabber motor excitation automatically is set to run slabber at base speed, minimizing power consumption.

At B in motor room, Fig. 3, are two 6-unit exciter sets, each with a 200-horsepower 220-volt induction motor driving five direct-current generators. These not only supply excitation for edger and slabber motors but direct current for dynamic braking of the big 5-unit set which is stopped in 2 minutes by this means.

At C in motor room is a 5-unit motor-generator set consisting of an 1100-horsepower 6600-volt synchronous motor driving four direct-current generators at 1200 revolutions per minute. Two of these are 200-kilowatt generators, one powers sections 3 and 4 of the delivery table and the other supplies sections 5 and 6 on far side of edger. Other two generators in this set, 250-kilowatt units, drive motors on new shear between tables 9 and 10. Sections 1 and 2 of approach table ahead of slabbing mill operate from 250-volt direct-current mill supply.

Slabbing and edging mills together employ three 700-volt direct-current motors totaling 12,000 horsepower main drive, fifteen 220-volt alternating-current motors totaling 700 horsepower and eight 230-volt direct-current auxiliary motors totaling 900 horsepower.

Ventilation in motor room is of the down-draft type, air being exhausted from under motors, cooled and blown back into the room.

Hydraulic guides just before and after the slabbing mill have a maxi-

(*Please turn to Page* 76)

Fig. 4—General view down hot strip mill. Steel passes from right to left

Tool Engineers Study Problems of Large, Small Lot Manufacturing

■ IMPORTANCE of tool engineering in the American system of manufacturing was emphasized throughout the annual meeting of the American Society of Tool Engineers in New York March 7-9. Probably in no country in the world could there be gathered together 500 manufacturing and design executives and technicians who are of more basic practical influence upon the manufacturing of the world's top quality mechanical products than that group which assembled for three days at Hotel New Yorker.

As was brought out by the nature of the program and the professional connections of speakers at the seven technical sessions and annual dinner, work of the tool engineer is just as important in small lot manufacturing—large electrical generators, for instance—as it is in the automotive industry where lots run into hundreds of units per day. Nature of the tools may vary considerably, but the fundamental principles of accuracy, long life, reasonable cost, ease of manipulation, etc., must be present in every case.

Shop Experience Essential

Regardless of the part which formal engineering education is playing and will play in the work of tool engineers—and admittedly more of this technical training is desirable—it was made obvious that the foundation for success in tool engineering still rests squarely on practical shop experience, inborn mechanical ingenuity and good common sense. Eli Whitney, who founded the interchangeable system of manufacturing 140 years ago, had these characteristics and so do those, for instance, who guide the mechanical destiny of the automobile business today.

In a troubled world, America's greatest hope for security both in national defense and eventually in coping with postwar world competition lies in the ability of American tool engineers quickly and effectively to solve new and constantly more difficult problems of producing improved products at lower cost.

Thinking of the situation in that light, the session on tool engineering education was outstanding. Keynote speaker at this session was Clifford S. Stilwell, executive vice president, Warner & Swasey Co., Cleveland. Mr. Stilwell expressed the opinion that the most effective way to train tool engineers is to have schools and colleges give them a good general education and then to have them do their "post-graduate" work of learning machine building and tool engineering right in industry itself as practical workmen in production shops. He questioned the possibility of the average school or college to maintain the necessary modern equipment, or of teachers to keep closely enough in touch with the ever-changing methods of industry, effectively to train tool engineers under academic conditions.

The "Better Men" Picked

Mr. Stilwell cited the experience of his own company in the training of turret lathe operators. Young men with special aptitude for the work are selected from among the general run of men in the shop and from there on they are given special instruction. In other words, the company gets the "better men" of which it constantly is in need, by building up its own men through carefully guided employe training methods.

J. W. Barker, dean of the college of engineering, Columbia university, New York, agreed that the average college could not hope to turn out experienced tool engineers, but that it could turn over to industry men with a solid foundation for effective specialized training within industry itself.

Another speaker, Don Flater, works manager, Chrysler Corp., Chrysler division, Detroit, stressed the point that the experience of the automobile industry has been that the best executives have been those who have come up from the ranks, regardless of what their previous education may have been. This accounts in his estimation for the extraordinary number of "practically trained" men who have risen to the top in the automobile industry—which includes many tool engineers.

Photo by Randolph-Maniatis-Garcia Inc.

Alexander H. d'Arcambal

Elected president, American Society of Tool Engineers, as noted in STEEL, March 11, page 15. During the past year he has been first vice president. Mr. d'Arcambal is sales manager, small tool and gage departments, and consulting metallurgist, Pratt & Whitney division, Niles-Bement-Pond Co., Hartford, Conn.

At the session devoted to economics of tooling, B. G. Tang, general superintendent, Schenectady works, General Electric Co., urged that in the launching of a new product care be taken against being swept into a condition of "overtooling" because of overoptimism of production engineers and salesmen. He recommended that wood or plaster models of a new product be constructed, not only to get a true idea of its appearance but also to allow definite visualization of tooling—including jigs and fixtures.

There are many grades of tooling, depending on the nature of production. These range from low-cost, temporary tools for single units, to costly and durable tools for heavy, continuous runs. Where there is any question as to the long continuation of a design or of its possibilities, Mr. Tang suggested the use of flexible tooling permitting of changes to suit modifications in the product. There is danger, he said, that the pride in craftsmanship prevailing among toolmakers will in some cases cause them to do too good a job on a set of more or less temporary tools—thereby running up their cost beyond economic limits.

Must Tool for the Product

At the same session, W. T. Stegemerten, superintendent of equipment methods, Westinghouse Electric & Mfg. Co., South Philadelphia, Pa., said that in "weaving the tools around the product" tool engineers constantly must bear in mind the question whether it essentially is going to be a "tailor-made" product or a mass production product. That will determine whether elaborate fixtures are justified, and will give an idea of how much must be done in primary operations and how much can be left for assembly.

When the time comes to replace tools, that should be the signal for intensive thought on how the tools can be improved when the new set is made. In any event a careful analysis of operations should be made when planning tools, as success in tooling depends on careful attention even to the smallest items.

F. E. Darling, wage standards department, camera works, Eastman Kodak Co., Rochester, N. Y., pointed out that modern large machine

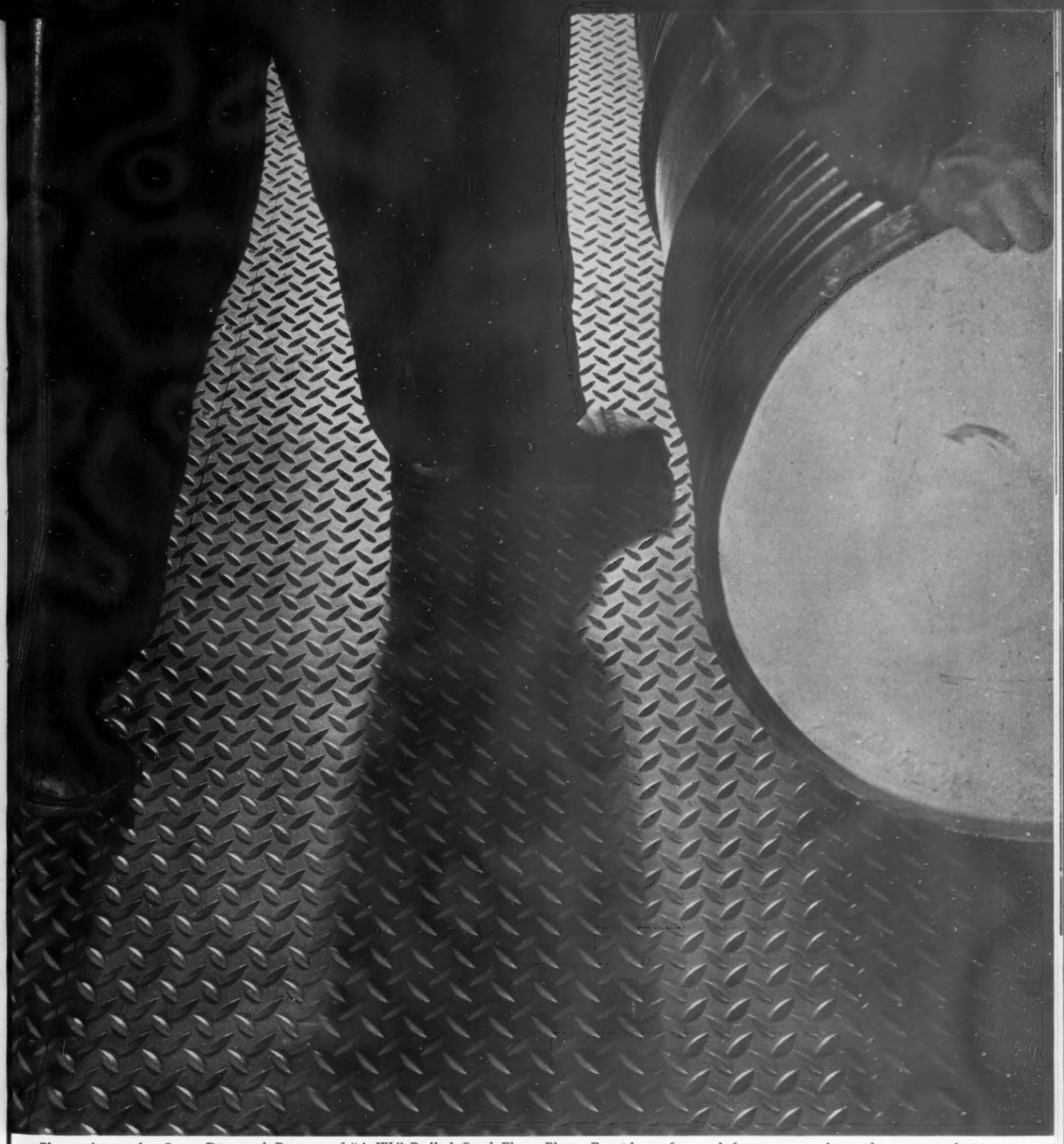


Photo shows the Super-Diamond Pattern of "A.W." Rolled Steel Floor Plate. Provides safe tread from any angle, under any condition.

For every "floor trouble zone". . . Some floors are habitually damp or greasy. Others quickly become hazardous. "A.W." Rolled Steel Floor Plate eliminates floor trouble zones because it is permanently non-skid. Prevents costly slipping and falling accidents. Reduces maintenance expense. Oil-proof, heat-proof, fire-proof, crack-proof. Easy to clean, quick to drain. Can be cut to any shape and installed almost overnight. Write for folder giving complete engineering data on "A.W." Rolled Steel Floor Plate.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS, CONSHOHOCKEN, PENNA. : : SINCE 1826 : : DISTRICT OFFICES AND REPRESENTATIVES—Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, New Orleans, St. Paul, Pittsburgh, Roanoke, Sanford, N.C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal—A. C. Leslie & Co. PRODUCTS INCLUDE—Steel Products in Carbon, Copper or Alloy Analyses : : Sheared Steel Plates : : Hot Rolled Sheets and Strip : : "A.W." Rolled Steel Floor Plates : : Billets, Blooms and Slabs : : "Swede" Pig Iron : : Reading Cut Nails.

tools, because of their accuracy and multiplicity of operations and settings, eliminate much work which formerly had to be done laboriously and expensively at assembly. He called attention to the advantages of modern portable tools on large work, permitting the tool to be brought to the work instead of demanding that the heavy, bulky work be brought to the tool.

In discussing these papers, W. J. Peets, assistant superintendent, Singer Mfg. Co., Elizabethport, N. J., said that any new product, to be justified at all, must be better or cheaper—and probably both. While it may be the responsibility of the designing engineers to make it better, it is squarely up to the tooling engineers to make it cheaper. Mr. Peets also emphasized the importance of careful analysis of all operations to determine, for instance, whether die castings, stampings, etc., are being used to the best advantage as far as eliminating secondary operations are concerned. Modern machine tools, he pointed out, often pay unexpected dividends through extra precision which makes final assembly easier and cheaper as well as resulting in a better finished and better working product.

During the session on precision small gears much time was devoted to showing how these extremely small parts can be held while their teeth are being generated or hobbed. Various examples of quick-acting and magazine fixtures were shown by means of slides. When it is considered that many of these items—watch pinions for instance—are so small that they can be lost under a thumb nail, some idea of the difficulty and delicacy of their handling is apparent. In spite of their small size, their minute teeth must be accurately spaced and perfectly formed. It was brought out that the present excellence of the modern talking movie as compared with those of a few years ago, is largely due to improvements in camera and projector gearing as brought about by tooling engineers.

Needed in Plastics Field

Another field in which tooling engineers are playing a tremendously important role is that of plastics—the successful molding of which is dependent upon the ingenuity and skill of tool engineers in designing and cutting the molding dies. A session was devoted to this subject, in addition to the session which was given up to punches and dies for sheet metal.

Screw machine tooling also came in for concentrated attention and it was pointed out that within 30 years improved tools had raised the quality of screw machine parts—large parts in particular—from the category of "accurate forgings", to that of precision parts accurate to split thousandths in many cases. At the present time some of the most remarkable screw machine work is being done in connection with the production of aircraft engines, where limits and finish impossible a few years ago are being attained on modern screw machines equipped with the latest tools.

Speaking at the session on cutting tools and material, W. G. Robbins, president, Carboloy Co. Inc., Detroit, made the statement that American machine tools, above all others, today are most capable of satisfactory performance with cemented carbide tools. This statement is based on Mr. Robbins' recent and extensive first-hand studies of conditions in machine shops abroad.

If Europeans seem to be ahead of us in the use of cemented carbides in machining steel, it is due rather to the types of tools peculiarly suited to operation by low-cost European labor, rather than to any fundamental superiority either of materials or methods.

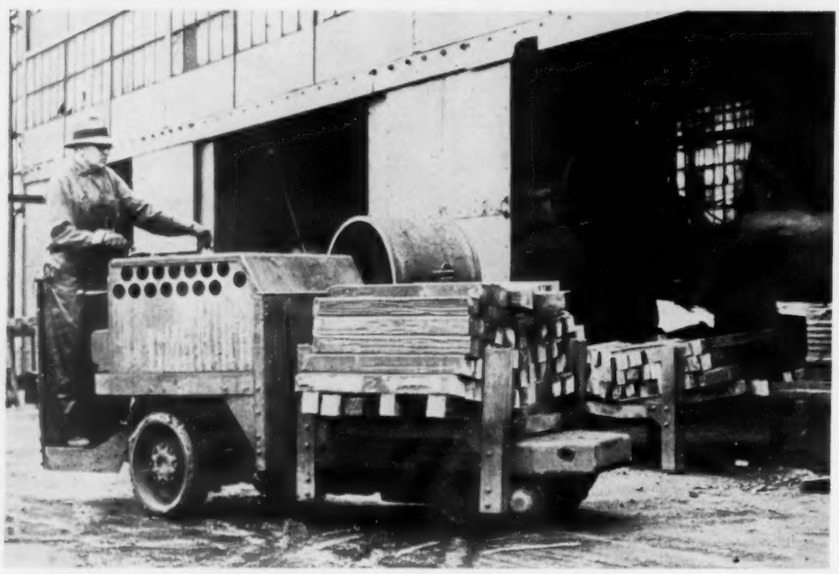
Sees Machining Time Reduced

Mr. Robbins pointed out that four grades of tungsten carbide are now suitable for doing 85 per cent of the jobs, and that with better understanding of grinding these tools, their efficiency and life constantly is increasing. The time is not far distant, he added, when it will take only four days to do an amount of machining which now requires five days.

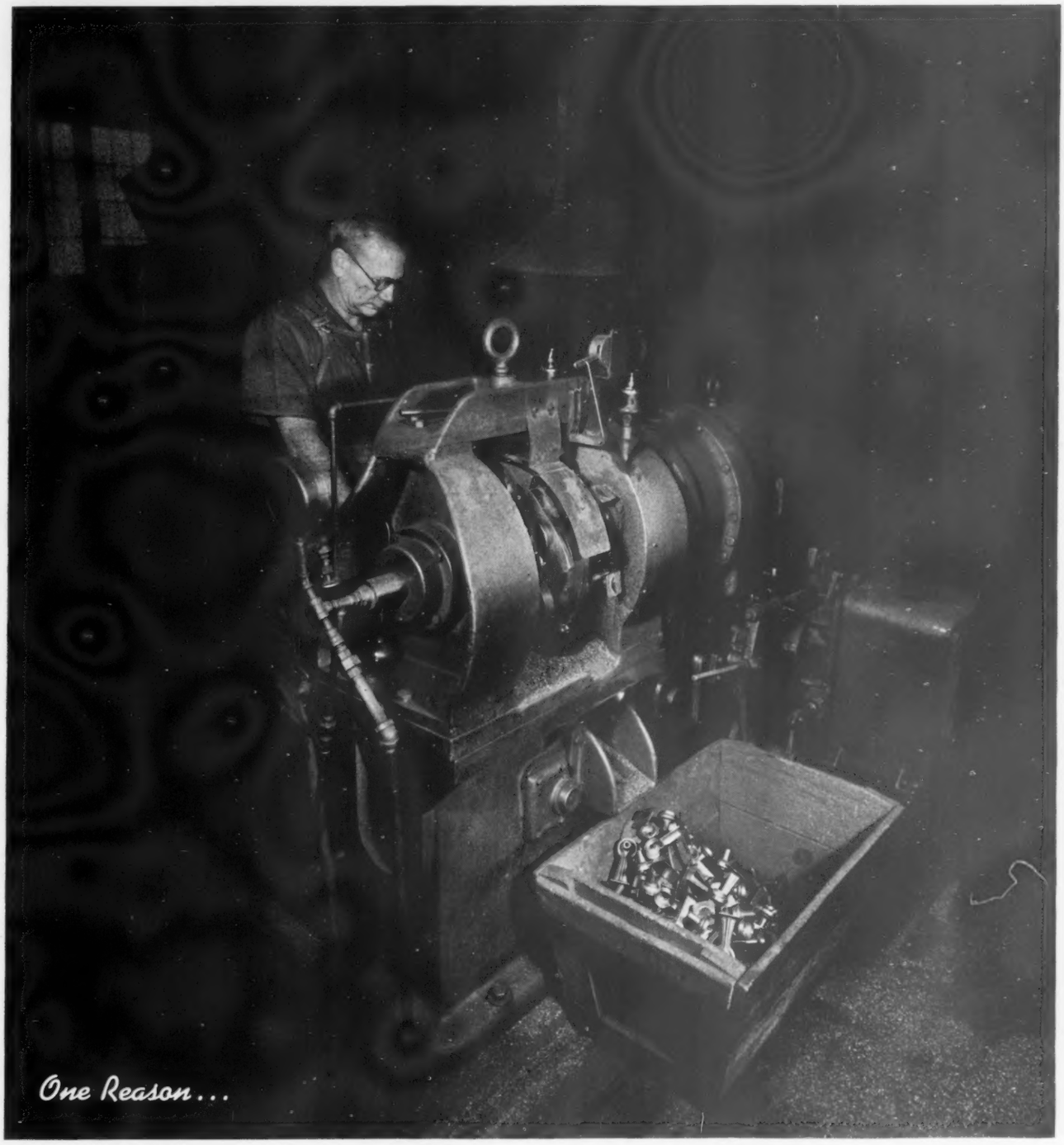
At the annual dinner, where as was noted on page 15 of the March 11 issue of STEEL, the new officers of the society were introduced by Retiring President James R. Weaver, John Younger, professor of engineering, Ohio State university, Columbus, O., presented the third and final report on "Causes of Unemployment." Prof. Younger, as chairman of the society's fact-finding committee, announced that all indications are that business spending—and not government spending—is the key to widespread re-employment throughout the United States. Scientific management, which has come in for much criticism of late, is simply good management, and when that fact is appreciated generally, there will be much better co-operation between the government and industry.

This same sentiment was expressed by Newbold Morris, president of council of City of New York, when he said that when the city had an engineering job to do, an engineer was employed not on the basis of his political beliefs or even his place of residence—but solely on the basis of his ability to do the job.

Industrial Truck Integrates Handling System



■ **Lost motions are eliminated from the handling system in the 10-acre plant of Dominion Forge & Stamping Co. Ltd., Walkerville, Ont., makers of crankshafts, mainly by use of skid-mounted containers moved by elevating platform battery trucks such as illustrated transporting cut stock from shear house to forge shop. Trucks alternate with overhead traveling cranes and tramrail hoists in moving material from operation to operation in unit loads weighing up to 5 tons. Photo courtesy Edison Storage Battery division, Thomas A. Edison Inc., West Orange, N. J.**



Why it's cheap to keep a pencil sharp

TEN YEARS AGO a manufacturer of pencil sharpeners had some good tooling ideas that he was anxious to use. Costs in one department could be cut approximately *thirty-five per cent* if he could find a practical and efficient machine to accommodate his ideas. But, to incorporate these into a simple machine presented several difficult problems.

The manufacturer called in one of our sales engineers and between the two a machine design was determined.

Today, because they designed a machine of tomorrow, it is still a most practical solution to his job. It still performs the original operations of drilling, counterboring, facing, and hollow milling, with a total run to date of approximately *four million pencil sharpener bases.*

This co-ordinated designing between the customer and our sales engineers has resulted in many unique and profitable machine installations. Some are portrayed in our booklet, "Since 1872 . . ." which we will be glad to send upon request.

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Platinum-Clad Metals

for Sheet, Screen, Tubing and Wire

New fabricating methods permit precious metals to be used economically, thus expanding their application. Use of platinum-group metals eliminates contamination in chemical processing equipment

By Dr. FRED E. CARTER
Director of Research
Baker & Co. Inc.
Newark, N. J.

■ UNQUESTIONABLY the resistance of platinum and palladium to chemical reagents and to oxidation at high temperature excels that of other metals. Considerable data has been compiled on the properties of high-purity metals of the platinum group. As evidenced in Table I, immunity to strong chemicals possibly is the outstanding characteristic. It will be noted in this table that certain combinations of iridium-platinum and rhodium-platinum are even more resistant to corrosion than pure platinum.

Corrosion is influenced by many factors such as concentration of the reagent, velocity and temperature of the solution, presence of abrasives, as well as the state of oxidation of the corrosive. However, the behavior of the platinum group of metals and some of their alloys in various solutions is well established and so Table I may be found useful as a preliminary indication of the resistance of metals to corrosion.

Principal reason for using platinum surfaces in processing equipment is to obtain extremely pure products. Contamination may decrease the efficiency of a chemical process or may cause an undesirable coloration, both of which may be avoided by use of platinum surfaces. In addition, absolute nonattack of the vessel gives long life.

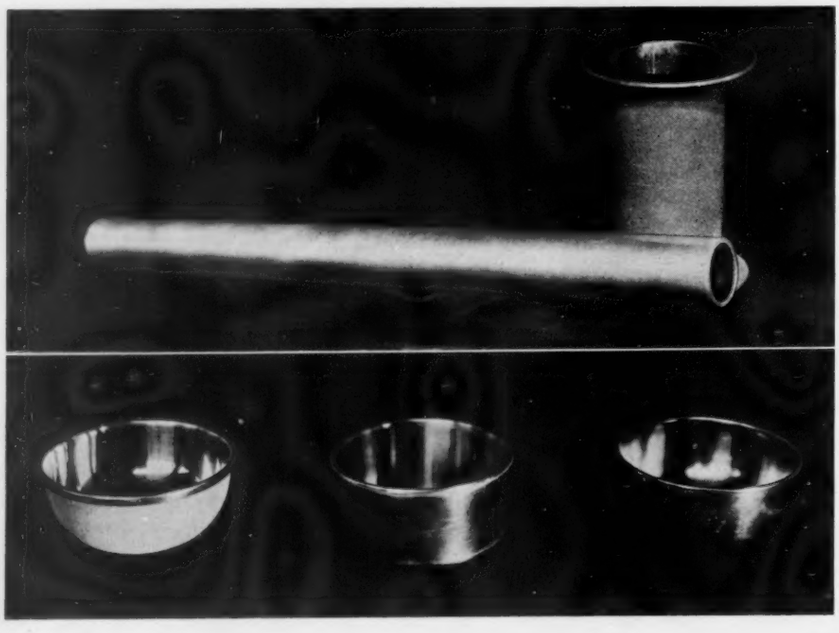
The high cost of platinum has been an important factor in limiting its application. Price of platinum now is $40 per troy ounce. However, this high price is greatly reduced when extremely long life of equipment and the high scrap value are considered. Platinum is practically inert chemically which means that almost 100 per cent can be recovered when used in processing equipment. Thus actual cost of using the metal is greatly reduced. Another factor is the decreased maintainance of equipment with platinum surfaces.

Price Remains Stable

Until this year, price of platinum was subject to considerable fluctuation. With Canada and Alaska now important sources of supply, the platinum price has fluctuated relatively little, even under war conditions.

The palladium price has been virtually unchanged for several years. Increased supplies available and a more stable price are likely to result in these metals playing a larger part in industry.

Possibly most important is recently perfected means of cladding relatively inexpensive base metals with platinum and palladium. This greatly reduces the amount of the high-priced metal necessary for a piece



Upper, types of platinum-clad tubing, platinum inside. The longer tube is seamless, the short flanged tube has a gold-soldered joint

Lower, types of platinum-clad dishes, platinum inside. Dish on left has been electroformed in nickel, built up on platinum. The others are spun from composite sheets

TABLE I

Action of Chemicals on Platinum Metals and Some of Their Alloys
In the table: A unattacked, B slightly attacked, C moderately attacked, and D strongly attacked.

Chemical	Pt	Pd	Rh	Ir	Os	Ru	90 Pt-10 Rh	90 Pt-10 Ir	80 Pt-20 Ir	70 Pt-30 Ir	80 Pt-20 Pd	90 Pt-10 Au	70 Au-30 Pt
Hydrochloric Acid	A	B	A	A	A	A	A	A	A	A	B	A	A
Hydrochloric Acid, 110C	A	B	A	A	A	A	A	A	A	A	B	A	A
Sulfuric Acid	A	A	A	A	A	A	A	A	A	A	A	A	A
Sulfuric Acid, 100 C	A	B	B	A	A	A	A	A	A	A	B	A	A
Sulfuric Acid, 250 C	B	C	B	A	B	A	B	B	B	B	B	A	A
Nitric Acid	A	C	A	A	C	A	A	A	A	A	B	A	A
Nitric Acid, 120 C.....	A	D	A	A	D	A	A	A	A	A	C	A	A
Hydrofluoric Acid	A	A	A	A	A	A	A	A	A	A	A	A	A
Acqua Regia	D	D	A	A	A	A	C	B	A	A	D	D	D
Acqua Regia, boiling ...	D	D	B	A	C	B	D	C	B	A	D	D	D
Acetic Acid	A	A	A	A	A	A	A	A	A	A	A	A	A
Acetic Acid, 118 C	A	A	A	A	A	A	A	A	A	A	A	A	A
Tartaric Acid	A	A	A	A	A	A	A	A	A	A	A	A	A
Oxalic Acid	A	A	A	A	A	A	A	A	A	A	A	A	A
Chlorine, dry	A	C	A	A	A	A	A	A	A	A	B	B	C
Bromine, dry	A	C	A	A	A	A	A	A	A	A	B	B	C
Potassium Bisulfate	B	C	C	A	B	B	B	B	B	B	B	B	B
Sod. Hydroxide, aqueous	A	A	A	A	A	A	A	A	A	A	A	A	A
Pot. Hydroxide, aqueous.	A	A	A	A	A	A	A	A	A	A	A	A	A
Ammon. Hydroxide, aqueous	A	A	A	A	A	A	A	A	A	A	A	A	A
Sod. Hydroxide, fused ..	B	B	B	B	C	C	B	B	B	B	B	B	B
Pot. Hydroxide, fused...	B	B	B	B	C	C	B	B	B	B	B	B	B
Sodium Carbonate, fused	B	B	B	B	B	B	B	B	B	B	B	B	B

Pt.—Platinum. Os.—Osmium
Pd.—Palladium Ru.—Ruthenium
Rh.—Rhodium Au.—Gold
Ir.—Iridium

of equipment and thus is expected to expand the application of these metals tremendously.

A number of materials have been tried in experimental work, including nickel, copper, monel metal and Inconel. Nickel is used most frequently. Metals clad with platinum-rhodium alloys and platinum-iridium alloys also have been developed. These latter combinations are even harder and more corrosion resistant than platinum alone. See Table I. An alloy of 70 per cent platinum and 30 per cent iridium shows a tensile strength of 200,000 pounds per square inch when hard rolled.

Sheets clad with platinum-iridium or platinum-rhodium alloys have shown hardnesses ranging from 70 brinell as annealed up to 360 brinell when hard rolled. When used as a cladding, the tensile strength depends largely upon that of the base metal backing material.

Improvements in cladding methods have been developed rapidly. Already large sheets of platinum and palladium-clad metals are available, sizes running up to 48 x 96 inches. In addition, clad material is available in the form of strip, tubing and wire in all commercial sizes and gages. Also clad gauzes of standard mesh and wire sizes are manufactured for use when maximum surface area of the metal is desired. (Platinum and palladium alloy castings with exceptional physical properties and high resistance to corrosion have been developed.)

The method used to produce clad sheet involves heating a slab of backing metal and a sheet of platinum, the two being bonded by pressing them together while hot. The composite slab then is rolled by usual methods, the cladding and backing metal reducing at the same rate. In practice, the platinum coating is usually not reduced to less than 0.002-inch thickness as it is difficult to prevent porosity in thinner coatings.

Clad wire is made by slipping a platinum tube over a rod of the base metal and then reducing the composite by usual wire-drawing methods.

Tubing is clad on the outside, inside or both in a similar manner. It is made by blanking out a disk of composite sheet and then turning this into tubular form using a tubing press and draw-bench.

Electroplates of platinum, palladium, rhodium and ruthenium are practical aids for industrial use under certain conditions of corrosion and wear.

Platinum may be melted without difficulty in either the high-frequency induction furnace or by use of oxyhydrogen or oxycity gas. A lime crucible generally is employed in melting.

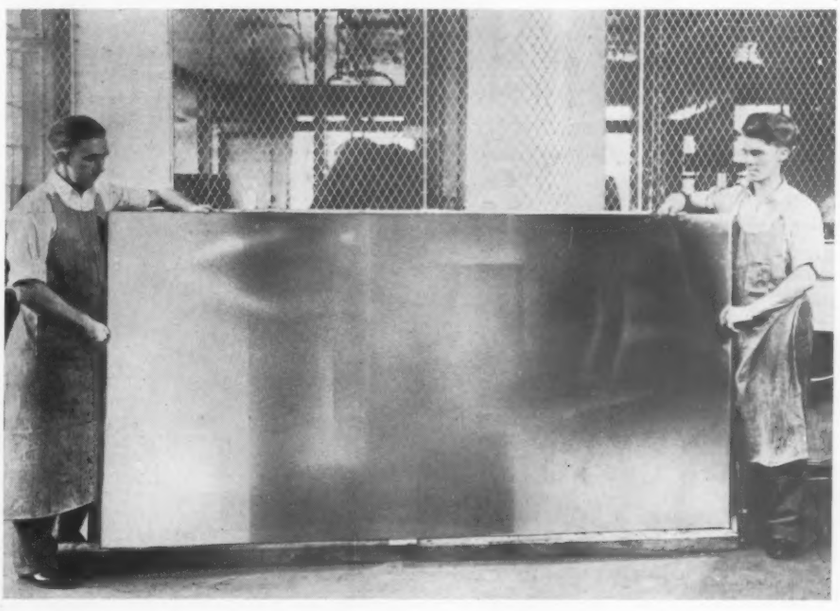
Hardens Faster Than Gold

Ingots of platinum and its alloys are worked at a bright red heat until they have undergone considerable reduction, after which cold rolling or cold swaging and drawing methods are employed.

In forging or rolling, platinum work hardens at about the same rate as copper but faster than gold or silver. So it must be annealed from time to time. Generally speaking, platinum and platinum alloys require temperatures of 1000 to 1200 degrees Cent. for complete annealing; addition of iridium causes an increase in the temperature required for annealing. For example, while 1000 degrees Cent. is sufficient for commercial platinum, 1100 degrees Cent. is required for 5 to 15 per cent iridio-platinum, and 1200 degrees Cent. is necessary when iridium content is above 15 per cent.

Spinning platinum is easy and so is widely employed in manufacture

(*Please turn to Page* 83)



A platinum-clad nickel sheet, 4 x 8 feet. Overall thickness is 0.030-inch, the platinum being only 0.002-inch. Photos courtesy Baker & Co. Inc., Newark, N. J.

Hi-Tensile Steel Ships

Investigation of welded high-tensile steel structures show excellent fatigue resistance to combined dynamic and static stresses but reveals considerable sensitiveness to notch effects from rough weld surfaces

PART I

By IR. G. deROOY

Chief of Construction
Dept. of Submarines
Royal Dutch Navy
and

Dr. P. SCHOENMAKER

Chief Metallurgist
SMIT-Transformer Works
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■ DEVELOPMENT of high-strength low-alloy steels has been of particular interest to shipbuilders because of the comparative success in obtaining higher yield point, higher tensile strength and ductility as well as great endurance limits, good weldability and corrosion resistance. Combine these factors with reasonable cost, and it is easy to see why these steels have been of special interest to Dutch shipbuilders whose practice is detailed in Part II of this presentation which will appear next week.

Prior to adoption of these low-alloy high-tensile steels in ships, however, considerable work was necessary in determining their characteristics, suitable welding methods and best manner to utilize the inherent strength of the material most effectively.

From paper in contest sponsored by James F. Lincoln Arc Welding Foundation, Box 5728, Cleveland.

As far back as 1925, previous results had indicated that increases in silicon content might be a step toward obtaining the desirable characteristics outlined above. At that time, a steel with about 1 per cent silicon was developed. Called "Freundstahl," it had a yield point of 50,000 to 57,000 pounds per square inch, tensile strength from 70,000 to 76,000 pounds per square inch and elongation of 26 to 28 per cent. With this silicon steel, certain disadvantages such as a tendency to form segregations were encountered. Also, it was difficult to roll and its corrosion resistance was not too good. It was evident that simply increasing carbon or silicon content was not the answer.

As a result of further researches, finally steels were made with the desired characteristics obtained by alloying some 0.10 per cents of chromium, molybdenum, manganese and with up to 0.5 per cent of copper to add corrosion resistance. These steels have the desirable characteristics demanded at a cost which allows their broad usage.

Table I—Chemical Analyses and Mechanical Properties of English and American High Tensile Steels

	C	Si	Mn	Cu	Cr	Mo	Ni	Yield Point in lbs./in.²	Tensile Strength in lbs./in.²	Elongation in Per Cent
	In Per Cent									
ENGLISH										
Manganese-copper steel	0.19	0.3	1.2-1.6	0.3-0.5	....	....	....	50,000-57,000	80,000-90,000	±20
Chromium-copper steel	0.15	0.25	0.5	1.2	0.6	....	....			
Shipsteel D	0.3	0.12	1.1-1.4	....	....	....	....			
AMERICAN										
Cor-Ten	0.10	0.48	0.27	0.43	0.90	....	....	56,000	74,000	35
Chromansil	0.13	0.78	1.32	0.13	0.43	....	....	60,000	82,500	35
Mayari R	0.08	0.40	0.72	0.62	0.56	....	0.33	65,500	82,500	28
Yoloy	0.07	....	0.38	0.92	....	....	1.79	48,500	71,000	35
RDS	0.07	....	0.84	1.45	....	0.10	0.97	60,000	82,500	25
Hy Steel	0.10	0.19	0.61	1.15	....	....	0.62	64,000	77,000	30
AW-70-90	0.15	....	0.60	0.42	....	....	....	57,000	78,000	25
High tens. Mn	0.15	0.18	1.60	....	....	....	....	57,000	88,000	15
Man-Ten	0.25	....	1.55	0.22	....	....	....	50,000	80,000	20
Mn-Mo	0.18	0.25	1.20	....	....	0.30	....	50,000	80,000	20
Sil-Ten	0.25	0.22	1.20	1.05	....	....	2.10	50,000	92,500	25

Used Widely in Germany

In Germany, for instance, this steel is used widely in bridges and shipbuilding but has not advanced beyond a tensile strength of 74,000 to 88,000 pounds per square inch with a yield point of 52,000 to 57,000 pounds per square inch and elongation from 18 to 22 per cent.

In England and America, high tensile steels have been constructed on the same basis with somewhat higher alloy content giving tensile strength from 80,000 to 92,000 pounds per square inch, yield point from 50,000 to 64,000 pounds per square inch and an elongation of about 20 per cent. Table I shows composition and mechanical properties of a number of these comparatively well-known steels, also manufactured in France and other countries.

It was soon found that as far as dynamic loads were concerned and also combinations of static and dynamic loads, joint strength in high-tensile steel was not considerably above, and in some cases was even below, that of mild steel. Cause was found to be excessive hardness of

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Almost everything in life today depends on steel--the clothes we wear, our transportation, the buildings we work in, the appliances that make modern life easier are of steel or made by steel machinery.

Not, of course, just any steel. The nails in your shoes are one type of steel, the tin-plated steel for packaging food is another, the sheet for your automobile body is a third. Youngstown maintains a great research department to make certain that on every order you place with us you will get the steel which will meet your requirements, and will help you produce a better product, at more profit to you.

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25-15B

Table II—Composition of Two High Tensile Steels

Steel	Carbon	Manganese	Silicon	Chromium	Copper
	In Per Cent				
A	0.19	0.96	0.52	0.35	0.54
B	0.19	1.41	0.30	....	0.34

Table III—Fatigue Strength—Pure Dynamic Stresses

Endurance Limit (in lbs./in.²)	High Tensile Steel — Steel A Base Metal	Steel A Welded	Steel B Base Metal	Steel B Welded	Mild Steel Base Metal	Mild Steel Welded
Rotating Bending	46,200	37,600	43,300	35,500	28,500	28,500
Flat Bending	43,300	31,300	42,000	28,400	25,500	25,500
Torsion	24,900	22,000	24,200	21,300	16,300	16,300

rivets, originally equal to that of the steel plate. A softer rivet metal improved results. Even then, riveting heavy plates demanded extreme care. This resulted in extensive investigation of welding of these steels, procedures recommended and qualities obtained.

Many difficulties were encountered when first welding high-tensile steels. Because of the high heat of the welding arc and the comparatively quick cooling of the molten material which follows, some of the special elements, especially chromium and molybdenum and to a smaller extent manganese, act to produce a hardening effect. Consequence is that next to the weld a distinct zone appears in the parent metal, distinguishable by greater degree of hardness. Microstructure through the zone also is different.

Seeking to avoid these difficulties, experience has taught that a high carbon content is most pernicious as it is often the cause of cracks. Thus carbon content should be limited to not more than 0.18 or 0.20 per cent.

Chromium content also must be limited to not over 0.5 per cent because of its hardening influence. Manganese content up to about 1.3 per cent generally is not troublesome. Silicon content appears to offer no difficulty if under 0.5 per cent. Steel containing too high an amount of alloying elements appears unsuitable for welding as the affected zone becomes much too hard and then its low ductility offers too little resistance against dynamic stresses. A steel that appears to be satisfactory contains about 0.20 per cent carbon, 1.5 per cent manganese, 0.5 per cent silicon, 0.5 per cent chromium, 0.3 per cent molybdenum and 0.5 per cent copper. This material gives perfectly sound welds with no cracks.

Table IV—Resistance of Welded Joints to Combined Dynamic and Static Stresses

Condition	Surface	Static stress in kg/mm²	Fatigue limit in kg/mm²
	High Tensile Steel		
As Rolled	Filed	0	30.5
		5	33.0
		10	35.2
		15	37.5
		20	....
As Rolled	With Mill Scale	0	22.0
		5	24.4
		10	27.7
		15	31.9
		20	35.0
Welded	Filed	0	16.0
		5	18.7
		10	22.9
		15	27.9
		20	31.2
Welded	Unmachined	0	19.0
		5	22.5
		10	25.0
		15	....
		20	....
	Mild Steel		
As Rolled	Filed	0	21.1
		5	23.0
		10	25.0
		15	....
		20	....
As Rolled	With Mill Scale	0	19.0
		5	22.5
		10	25.0
		15	....
		20	....
Welded	Filed	0	21.5
		5	23.2
		10	25.0
		15	....
		20	....
Welded	Unmachined	0	17.5
		5	21.0
		10	25.0
		15	....
		20	....

Two Typical Steels Tested

For investigation of mechanical characteristics of welds in high-tensile steels, two typical steels were chosen of analyses given in Table II. These were welded with heavily coated electrodes of high quality.

Tensile, bend, impact and fatigue tests were made on specimen bars from ½-inch plate. Welded specimens were taken from a 90-degree V-weld.

Tensile strengths of parent metal tested about 80,000 pounds per square inch and weld metal about 76,000 pounds per square inch, ample to meet the requirements originally outlined. Elongation of weld metal was 28.4 per cent. Of great practical importance is the fact that the yield point of the parent metal practically equals that of the weld metal.

Bend tests gave satisfactory results, capable welders being able to produce welds withstanding a 180-degree bend.

Charpy impact tests revealed that due to composition and production methods, high-tensile steel plate possesses an impact value in a direction transverse to direction of rolling which is a considerably lower value than in the longitudinal direction. One steel, for instance, showed an impact value of 12 kilogram-meters per cubic centimeter in a longitudinal direction but only 7 kilogram-meters per cubic centimeter in transverse direction.

For this reason, naval construction prescribes impact values of plate in *transverse* direction may not be less than 9 kilogram-meters per cubic centimeter.

Fatigue Testing Important

Above tests indicate weld metal can be produced of equal tensile value to the parent metal as far as static stresses are concerned. In shipbuilding, however, considerable dynamic stresses occur, and so fatigue testing is extremely important work. In general, fatigue can be produced from bending, torsion and tensile-compression stresses. For these three classes of fatigue, three special machines were developed. Each determined highest stress that specimen would withstand for 5,100,000 stress variations.

Table III shows results of fatigue tests (with dynamic stresses only) on the two high-tensile steels in Table II and on mild steel as a comparison. It appears that fatigue strength of the weld metal is lower than that of the parent metal. Consequently fatigue strength of the welded joint also is below that of an unwelded plate. With mild steel, it is just the other way around, as the fatigue strength of the weld is greater than that of the plate.

Thus high-tensile specimens broke in the weld on fatigue testing, while the mild steels broke outside the weld. This indicates an important field is still open for improvement in quality of electrodes and welding procedure here. Possibly increasing amount of alloying constituents in the electrodes would be a help.

One thing Table III illustrates well is that fatigue strength of welded joints in high-tensile steel is considerably greater than welded mild steels, amply justifying their use in welded ship constructions.

These investigations also revealed that notch effects played an important part in determining the fatigue strength. Presence of mill scale on welded plate was found to exercise a certain notch effect with decreased fatigue strength. In one case, presence of mill scale was found to reduce fatigue strength of a high-tensile steel from 43,500 to 32,000

(*Please turn to Page* 83)

THESE are truly the days when service is reflected by the foresight and progressiveness of the past—when the keeping of one's house in order during depression periods now pays dividends to customer, dealer and distributor.

The piling-up of unfilled orders, the mad scramble for raw materials and machinery, the breakdown of production facilities, the broken promises on deliveries—all these are the result of lack of confidence and stability, and of delay in the preparation of proper service perspective during slow periods.

For almost a century—since 1845—R B & W has pursued an inflexible policy of keeping its house in order. During many depressions, many booms—and many wars—R B & W has constantly built a background of plant facilities, production methods, raw material sources, and sound sales-engineering service—in bad times as well as good.

Today, therefore, R B & W can offer a true service perspective and is in an enviable position to help those needing stable facilities for bolts, nuts and other threaded industrial fastenings.

315

BOLTS EMPIRE NUTS-RIVETS

RUSSELL, BURDSALL & WARD
BOLT AND NUT COMPANY
PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

Building Up Wear Resistance

Certain flame-hardened molybdenum steels meet exacting requirements of screw conveyors, dies and dipper teeth where high mechanical strength and toughness must be combined with resistance to wear

■ CERTAIN classes of mining equipment demand exceedingly high wear resistance. Manufacturers and users of such equipment are continuously racking their ingenuity to find economically practical materials that will wear well enough to keep replacement costs within reasonable limits.

The problem is complicated because other properties such as strength and toughness are necessary. Such properties are not always compatible with good wear resistance. Also, since many parts are expendible, it is not always easy to strike the correct balance between first cost and replacement costs. There is a point beyond which savings in replacement expenses are not likely to offset added first cost.

Flame hardening provides a solution to the problem that works out well in some cases, and with some materials. It has been quite successful on parts made from certain types of molybdenum steels. Flame hardening permits use of a steel that meets strength and toughness requirements economically, and also permits obtaining the required wear resistance economically.

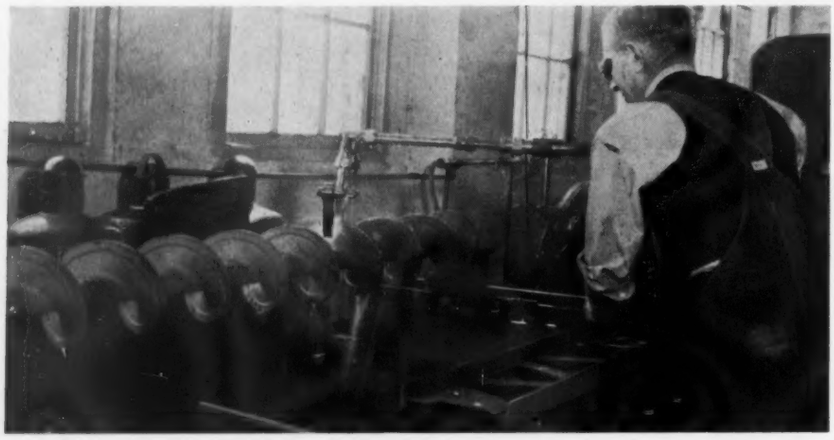

Fig. 1—Cast molybdenum steel conveyor screw being flame hardened. Photos courtesy Climax Molybdenum Co., 500 Fifth avenue, New York

Fig. 2—Flame hardening dies for a steam hammer. Parts not requiring maximum hardness are drawn. Here faces are finished to 390 brinell, 3/8-inch deep. Remainder is 220 brinell

Molybdenum Steel Solves Difficulty

A typical application is a cast steel screw for a conveyor, or classifier, handling cinnabar (quicksilver ore). This ore is highly abrasive. Also, considerable strength and toughness are required because of the pressure and impact loads in operation. Shape of the screw further complicates the matter. It is 10 feet long, and the flights are 8 inches in diameter, ⅞-inch thick. Made of steel, the shape of the screw made liquid quenching without warping practically impossible. Other materials that were hard enough proved too brittle.

The difficulty was finally overcome by casting the screw from a chromium-molybdenum steel resembling SAE 4140 wrought steel. Certain areas then were flame hardened. The screws are cast by Western Steel Casting Co., Portland, Oreg., and flame hardened by Central Machine and Flame Hardening

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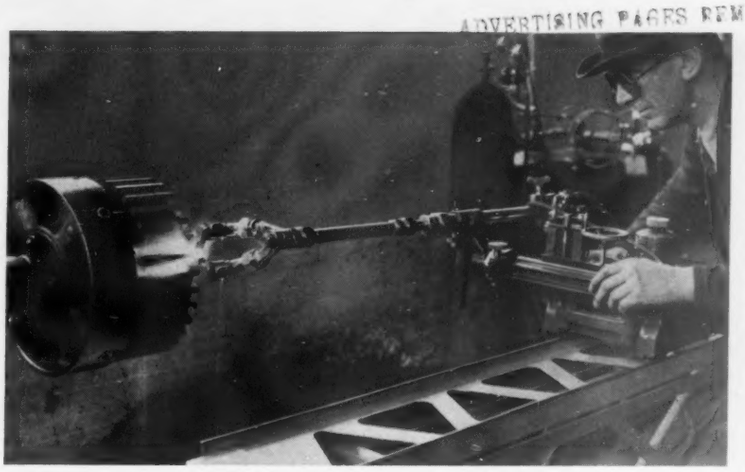


Fig. 3—Alloy steel gears for severe service are flame hardened

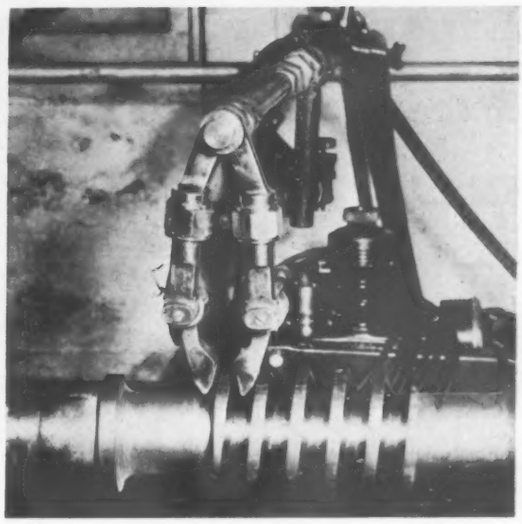


Fig. 4—This is arrangement for flame hardening worms to give maximum life of wearing surfaces

Works, also of Portland. A typical analysis is:

Carbon	0.40 per cent
Manganese	0.65
Silicon	0.30
Chromium	0.60
Molybdenum	0.25

After casting, screws are annealed at 1575 degrees Fahr. and then machined. Next step is to normalize at 1650 degrees Fahr., and draw at 600 degrees Fahr. to remove machining stresses and to produce the requisite strength and toughness in the screw. The flights are then flame hardened on both sides to a depth of 3/16-inch and over an area extending 2½ inches from the outer edge. Fig. 1 shows flame hardening operation. The steel is water quenched by a jet immediately behind the flame tips. After hardening the screws are drawn at 450 degrees Fahr. to relieve any possible stresses. The net result is a hardness of 630 brinell over the hardened area.

Process Lengthens Screw Life

This process gives cast steel screws that last three times as long as any formerly used. In fact they have handled as much as 90,000 tons of ore before wear has necessitated replacement. When the fact that these parts are not exactly cheap is taken into consideration, to say nothing of the interruption to production entailed in making replacements, the improvement in individual service life is obviously well worth while.

The same method is used to lengthen life of dipper teeth on power shovels that work in highly abrasive material. The teeth are cast from the same type of chromium-molybdenum steel as the classifier screws just described. The teeth are quite large and heavy, being 10 inches long and 4 inches square at the butt.

As these dipper teeth are continually subjected to heavy shear and impact loads, as well as to abrasion, a good combination of strength and toughness at high hardness is required. In this case it is obtained by normalizing the teeth from 1650 degrees Fahr. and drawing at 1200 degree Fahr.

The teeth are flame hardened 3 inches back from the tips on both wearing faces. Depth of the case varies from 3/16-inch at the tip to ¼-inch on the bevel. The steel is water quenched. Hardness produced is about 680 brinell. This procedure has added considerably to the useful life of the dipper teeth, and so has reduced the cost and delay involved in replacing them.

The above two companies have made use of flame-hardened cast molybdenum steel in other cases. One is for die blocks of a 5-ton steam forging hammer, and another for heavy-duty worm and spur gears.

The die blocks are cast from a chromium-molybdenum steel of the same analysis as previously mentioned. As seen in Fig. 2, the block section is quite heavy, this block being 20 inches long, 11 inches wide and 9 inches thick. After machining, the blocks are normalized from 1700 degrees Fahr. and drawn at 700 degrees Fahr. for 8 hours. This treatment produces a hardness of about 260 brinell through the section. Then they are flame hardened on the working surface to about 650 brinell to a depth of ⅜-inch. After being hardened, they are again drawn at 700 degrees Fahr., which reduces the case hardness to about 390 brinell.

Net result is a die block with a case sufficiently hard to meet the requirements of the service as regards wear, combined with a core that is strong and tough enough to stand the impact loads imposed. The proof of the performance capacity of the blocks rests on the fact that some of them have been in service for over a year without showing scoring or wear on the working surfaces, or any rolling on the edges.

Gears, both spur and worm, are cast from a steel of an analysis.

	Per Cent
Carbon	0.30-0.35
Chromium	0.60-0.80
Molybdenum	0.20-0.30

Processing of these gears is similar to that described. After being annealed, teeth of the spur gears and flights of the worms are machined and hardened to about 520 brinell. Depth of case depends on size and profile of the teeth. After flame hardening, large gears are drawn at 450 degrees Fahr. to relieve possible stresses. Out of 100 worm gears that have been flame hardened, not one has shown distortion greater than 0.0005-inch.

Fourth Review of Tin And Its Uses Issued

■ Fourth Issue of "Tin and Its Uses" is now available from International Tin Research and Development council, Fraser road, Greenford, Middlesex, England.

Offered free, the publication describes such late developments as white-bronze plating, which resists tarnish and can be highly polished, and application of thick and adherent tin linings to large pieces of apparatus used in the food industry. Other topics include an authoritative statement by Sir William G. Savage, B.Sc., M.D., testifying to the wholesomeness and nutritive qualities of canned foods, history of decorated tinplate containers and strategic importance of tin in war-time.

Expands Facilities for Producing Precision Iron, Steel Castings

■ BIRDSBORO Steel Foundry & Machine Co., Birdsboro, Pa., has completed expansion of its facilities for the production of precision iron and steel castings by the Randupson process. It recently acquired the Scott foundry of the former Reading Iron Co. at Reading, Pa., which has been fully modernized and re-equipped for producing iron castings in large volume. Production of iron castings has been concentrated at this point. The main foundry at Birdsboro now is devoted entirely to steel castings. The roll and hydraulic press departments at Birdsboro, of course, are continued as separate divisions.

The Scott plant for iron castings is equipped with two 54-inch cupolas, an air furnace for close control work, along with auxiliary equipment including 40 and 60-ton cranes, two wall cranes, sand mixing equipment, etc. Building is L-shaped. Main section is 80 x 300 feet. Wing is 100 x 200 feet. Larger section houses furnace, sand-mixing equipment and pouring floor for large castings. Smaller castings are poured in the wing, part of which constitutes the shakeout section for all castings. Castings range in size up to 50 tons. Plant is devoted largely to precision work such as automotive dies, special bed plates, machine parts and the like.

Necessity for expansion of the Birdsboro company's facilities may be better understood by a clearer insight into the Randupson process itself. Briefly, it consists of substituting Portland cement for other bonding agents in molds, producing molds free of distortion without flasks or oven drying. Fins, pinholes and porosity are practically eliminated. Finished castings conform closely to pattern and have smooth contoured surfaces.

Process Covers Many Metals

The process may be used to make practically all types of iron, steel and nonferrous castings but the tendency is toward work calling for extremely close tolerances. It permits production of automobile body dies requiring relatively little finishing. Dies may be offered in the future on which only hand-finishing will be required. Diaphragm rings in steel are produced consistently within plus or minus 0.005-inch. Large steel mill pinions are cast with teeth to tolerances of 1/32-inch on the side. Mill gears 26 feet in diameter with an 18-inch face are cast to same tooth tolerance.

Generally speaking, iron and steel castings are produced in the same way but with certain variations. Patterns are same as in usual foundry practice except that in making a mold for a symmetrically designed casting, a full pattern is unnecessary. Often a half, quarter or even an eighth pattern is sufficient. Closeness with which castings conform to patterns may permit changes in design to effect weight reduction.

In making repetitive molds for small castings, patterns are mounted on boards in the conventional manner, one set for drags and the other for copes. A frame then is attached to each board, forming a core box which is attached to a molding machine. A sufficient amount of prepared new facing sand is shoveled in to cover the pattern to a depth of about 1½ inches and line box sides.

If mold is shallow, balance is backing sand. Deep molds are practically filled with reclaimed lumps, rubble or even dry cinders with just enough backing sand to provide necessary strength, topped off with backing sand and jolted. Top of mold is scraped off smooth, a planed iron plate clamped in place, entire assembly rolled over and placed upon a roller conveyor.

After rolling over and drawing the pattern, box or sides are lifted from mold, replaced on pattern board and operation repeated. Mold and plate move toward end of conveyor where they are removed by crane and placed on the floor to dry. Finished molds dry on plates 10 to 18 hours. Then they are hard enough to be removed and stacked for remainder of 48-hour drying period.

Few Iron Rods Used

Large molds are prepared in wood forms, much the same as with small molds. Patterns first are faced with new sand and form filled in with rubble, backing-up sand and cinders. Comparatively few iron rods are used for reinforcement purposes. Hooks are rammed into mold for ready handling by crane which may be done without danger after the mold has dried for 12 to 18 hours.

All internal cores, which may be removed easily, are made from the same sand mixture. Smaller sand cores require little or no reinforcing. Sand cores and mold sections are as hard as concrete when dried and fit together precisely. Little nailing is required on molds for large iron and steel castings, none on small work. Setting runners and risers follows usual procedure. As a safety factor, a steel framework is usually built up around molds for large castings but is unnecessary for smaller jobs.

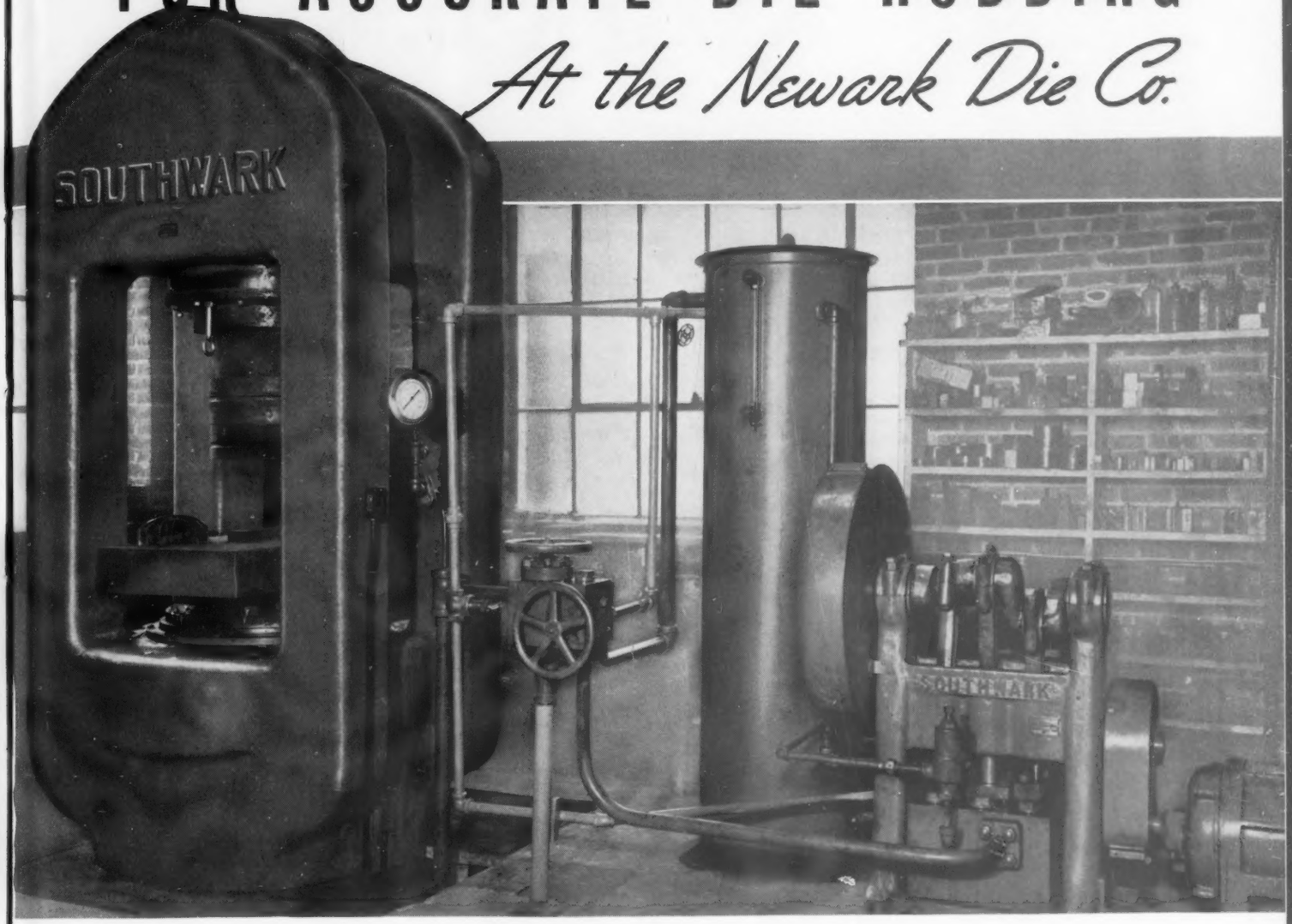
No artificial heat is required for either cores or molds. No distor-

(*Please turn to Page* 72)

General view of steel foundry with several Randupson molds on molding floor in foreground. Note sharp contours of these molds. Newly formed molds are darker than the dried ones. Three 30-ton open hearths are in background. Closing and pouring floor is in front of open-hearth section

FOR ACCURATE DIE HOBBING

At the Newark Die Co.



● Extremely accurate in operation by virtue of its rugged one-piece steel casting and long cylinder guide this 2,000-ton Southwark hydraulic press is used in making all types of molds for both thermo plastic and thermo setting materials at the Newark Die Co.

Absolute control of ram speed keeps flow rate constant and enables proper flowing of the cold soft steel being hobbed. The same finish of the hardened steel hob is thus imparted to the die cavity and duplicate cavities can readily be obtained.

The two-pressure Southwark pump provides low pressure approach stroke with automatic change over to a high pressure working stroke, ensuring efficient and economical operation. Consult with Southwark for complete die hobbing units, designed and built to meet your specific requirements.

BLW
THE BALDWIN GROUP

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Division of THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

Routing Raises Output

Large machine-tool builder perfects a routing routine which aids in increasing production, permits close follow-up on progress of work. Departments placed for shortest sequence for working operations

PART I

By P. A. ABE

Vice President in Charge of Engineering and Production
Monarch Machine Tool Co.
Sidney, O.

■ GETTING maximum production out of a given amount of floor space —the problem facing so many machine tool manufacturers today— is a complicated one involving many factors.

First of all, it involves installation of the most effective production facilities, including replacement of old equipment. Also, it involves miscellaneous considerations such as use of carbide cutters, efficient materials-handling equipment, proper lighting, quick and effective operator training, and use of more and better gages—to mention only a few.

Three related things too often overlooked in connection with this problem are: Layout of plant departments, scheduling and sequence of individual operations, routing and control of materials through the plant. These are somewhat intangible matters. The difference as far as profits are concerned between an efficient and an inefficient plant layout, operations scheduling and materials-routing program is difficult to measure. Results, nevertheless, are real and show up in an important way at the end of the year when profits—or losses—are determined.

The plant of Monarch Machine Tool Co., Sidney, O., Fig. 1, has been built up over a period of 30 years by making 18 additions to an original structure that covered 9960 square feet. Incidentally, five of the expansions were made in the last five years. Because of the foresight of the founders in choosing a location where it has been possible to expand in all four directions, and because those who have planned the expansions always have planned carefully with the future in mind, the general plant layout now constitutes an integrated whole.

Departments Grouped Together

Except for the office wing, which houses a 400-seat auditorium, a photographic laboratory and several rooms on the second floor for employe training, the plant is a single-story structure. The accompanying floor plan, Fig. 1, indicates the logical way in which various departments are grouped together and how back-tracking has been eliminated almost entirely.

Rough castings, made in nearby independent foundries, are delivered at a back door where they are either stored or sent directly to the adjacent cleaning and painting department. This department, in turn, leads directly to the planing department. Forgings also are delivered at a back door at loading platform No. 2 on the railroad siding. This second door leads directly to the chucking lathe department. Steel is unloaded further on along the platform opposite the steel storage racks where it is only a short distance from the bar machines and lathe department.

Both heat-treating department

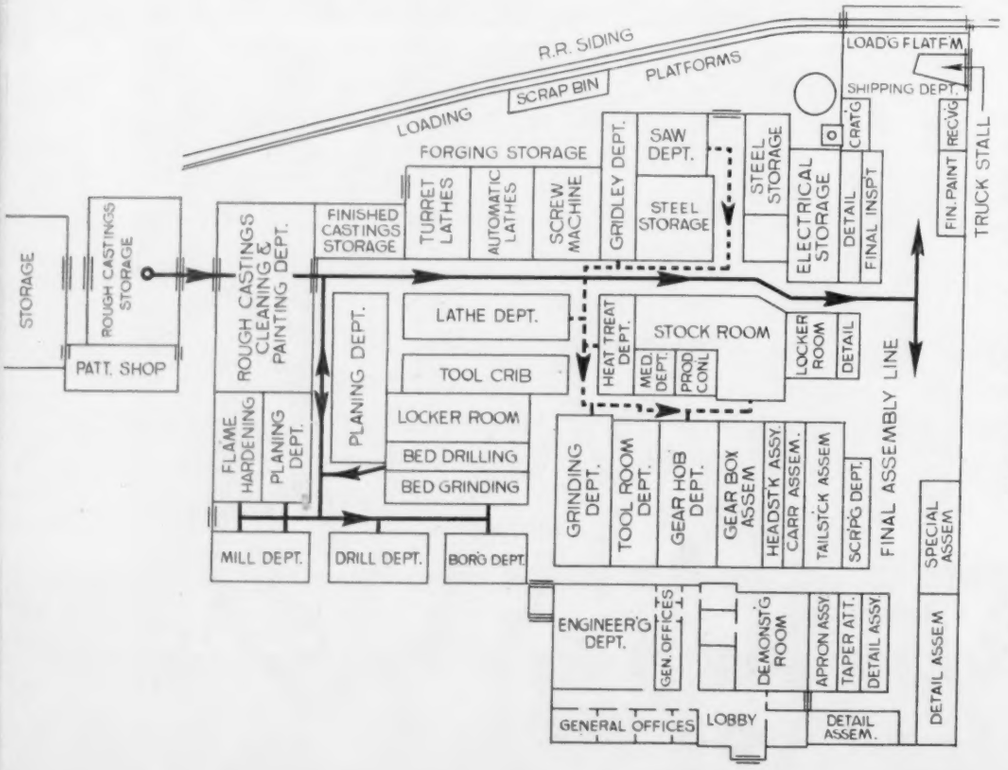


Fig. 1—Floor plan of Monarch plant showing logical departmental arrangement which allows smooth flow of work through the plant

and stock room are centrally located, the heat-treating room being near the center of machining operations, while the stock room marks division line between machining and assembly departments. Finished parts are received from the machining department on one side and are issued to the assembly department on the other. Thus neither department has to go very far to the stock room to deliver or to get its parts, and the two in no way interfere with each other.

In line with the same reasoning, the tool crib in the machining department is centrally located. So also are the two locker and washrooms—one in each department. The whole plan of Monarch's plant layout is based on the principle that when work is piled on a truck and is being transferred around from one place to another, no profit is being made.

Routing Planned Carefully

The method of routing materials through the various departments in the plant and of controlling departmental operations likewise is a result of deliberate planning based on careful study.

All Monarch lathes are built to fill specific orders. Not one is built "for stock." Orders coming through from the sales department are started in the shop by the production control department. This department assigns a schedule number to each machine and sends the order first to the engineering department. Here the specifications are checked and plans drawn up for any special equipment or nonstandard items required.

Back in the production control department, a work sheet on a standard form then is made out for each machine. This carries an itemized list of all large parts and subassemblies required for each machine, including the official factory number of each unit. On one side of this sheet large parts are listed including bed, pan, legs, headstock cover, lead screw, feed rod, etc. On other side of this sheet are the various assembly units such as spindle, pulley shaft, carriage, gear box, pump and piping.

This work sheet then goes to the production department in the shop, where a production schedule is made up for a month in advance. In this way completion date of each

Fig. 2—A foreman can tell at a glance which job is in progress on any machine in his department. Each machine has a portion of the wire rack. When a job is assigned, the foreman simply puts the routing card for that job in proper place in rack

order is determined. In making up the monthly schedule, all units of same size and type are consolidated and what is known as a "stock withdrawal card" is made out for each of these units. Thus, all the parts required for 10 aprons No. BB-7-4, or 12 carriages No. BB-8-14, or 15 tailstocks No. BB-12-2, are ordered at one time.

These stock withdrawal cards then go to the boys who handle the stock records. On the backs of these cards the stock boys itemize the quantity and official factory number of every individual part—each nut, bolt, spring, gear, collar, etc. required to fill the order.

Inventory of parts is maintained on the usual "maximum-minimum" plan. The production control department has determined maximum and minimum numbers of each part that should be kept on hand at all times to maintain a certain production level. A "stock card" is kept for each part—there being some 10,000 altogether. As each order for parts is noted on the stock card, the stock boy automatically observes existing condition of inventory. When inventory drops below an established minimum, he issues a production order for more parts. Order quantity in every case is twice the minimum. We have found that this ratio works out most satisfactorily. Order quantities range from 6 to 1000 pieces.

Business Controls Inventories

When business picks up it is necessary to increase the parts inventory. In such case the stock boys are instructed to increase every parts order they put through by 5, 10 or 25 per cent—whatever may be decided upon to suit the circumstances. By the same token, when business falls off the ratio is dropped correspondingly. Parts inventory thus is "geared" to the ever-changing production level.

When the general foreman of the machine division gets an order for parts, he originates a blue "routing card." With this routing card goes a blueprint of the part setting forth all specifications required by the

(*Please turn to Page* 84)

Fig. 3—Heavy jigs and fixtures are stored on shelves directly on loading platforms. This permits handling them conveniently, even on shelves high above the floor, using the lift truck shown which also moves them directly to the job without further loading

New York Completes Another Link In Impressive Highway Development

Utilizing temporary toggle bents over the 99-ft. high supporting towers, the 300-ft. Newtown Creek span was erected as a cantilever without obstructing navigation. Compared with the old low-level drawbridge, which it replaces and which in 1938 recorded 14,348 openings, the new high-level river crossing has evident traffic advantages.

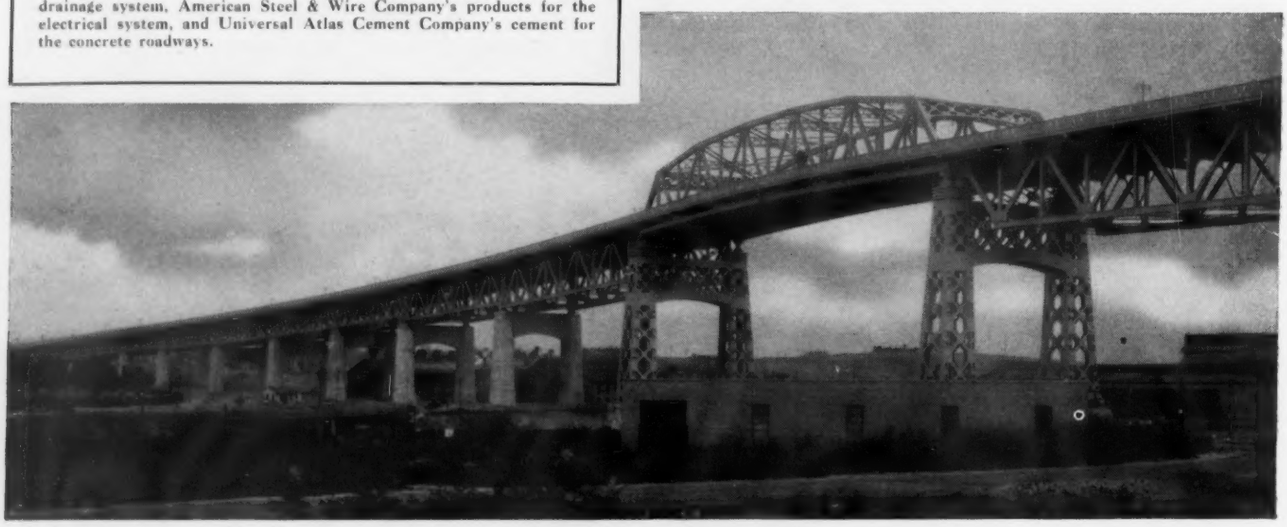
Carnegie-Illinois Steel Corporation's rolled shapes were used for this structure, including COR-TEN steel gutters and splash plates for the drainage system, American Steel & Wire Company's products for the electrical system, and Universal Atlas Cement Company's cement for the concrete roadways.

TYPICAL of New York's outstanding betterments for the safeguarding and speeding of traffic is the recently completed Meeker Avenue Bridge, the most important link of the new "Connecting Highway" planned as a direct thoroughfare from Brooklyn Bridge Plaza to the Triborough Bridge.

It is a splendid example of a modern, elevated highway. Rising from grade to a 120-feet navigation clearance over Newtown Creek, it overpasses existing streets and provides a 1¼-mile express artery between the Boroughs of Brooklyn and Queens.

Approximately 3500 feet of this bridge is a steel viaduct structure comprised of a 300-foot river crossing flanked by 21 deck truss spans varying in length from 118 to 230 feet. It carries two 32-foot roadways separated by a 4-foot central mall and two 8-foot sidewalks protected by steel framed curbs and barricades.

American Bridge Company not only fabricated and erected the 16,315 tons of structural steel (2200 tons of which was high-strength silicon alloy), but also contracted for and satisfactorily completed within contractual schedule, the entire ready-for-traffic superstructure—even to the concrete roadways, railings, drainage and lighting systems.



AMERICAN BRIDGE COMPANY

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UNITED STATES STEEL

Glass Fiber Insulates New Appliance Wires

■ Two Deltaglass 300-volt special purpose appliance wires insulated with glass fiber yarn have been introduced by General Electric Co., appliance and merchandise department, Bridgeport, Conn. One is a lead wire recommended for small electrical appliances. The other is Deltaglass waffle iron hinge wire recommended for flexible hinges.

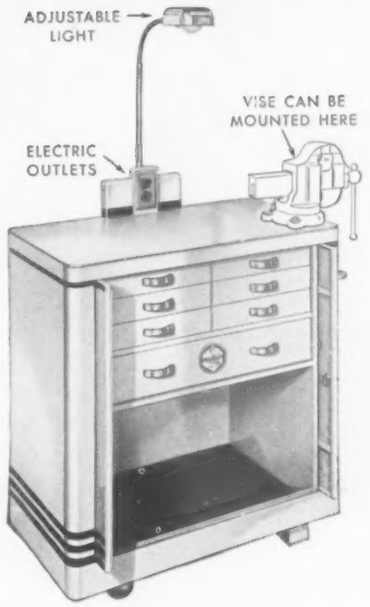
The lead wire is insulated with saturated felted asbestos and a varnished glass yarn braid overall. It has high heat-resisting characteristics and high dielectric strength. It is resistant to abrasion and moisture, and is available in sizes Nos. 18 to 8 inclusive with either a solid or stranded conductor.

Deltaglass waffle iron hinge wire has a stranded nickel conductor with impregnated glass fiber insulation and an overall varnished glass braid. It is available in size No. 18 only. This wire is small in diameter, flexible and abrasion-resistant. The glass insulation used for these wires consists of fine glass fibers less than 0.002-inch thick grouped together into a glass yarn of great tensile strength and flexibility.

Wrench Manufacturer Offers Trade-In Service

■ Users of socket wrenches now have an opportunity to trade in their old tools for those of latest design without sacrificing their investment, according to a recent service inaugurated by Blackhawk Mfg. Co., 5325 West Rogers, Milwaukee.

Trade-in applies to two special wrench sets, 100DD and 35B, and is effective in United States and Canada from March 1 to June 30, 1940. Buyer receives $25 credit on 40 old wrenches toward the purchase of a special 100DD assortment containing 87 modern Nugget socket wrenches, box-types and other essential tools in a portable wrench bench. A $5 allowance on a smaller quantity of old tools is credited if 35B set is purchased. The 35B includes a modern case and 34 Nugget wrenches. The company contends the user makes a substantial saving in his investment because 7/16-inch drive Nugget wrenches in the 100DD and 35B eliminate duplication between ⅜ and ½-inch square drive series.



Twenty-five dollar allowance for old tools is given toward the purchase of the above 100DD wrench set

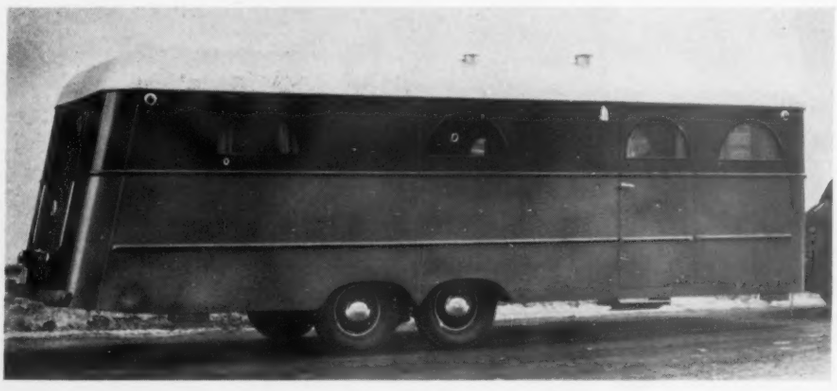
All Steel Trailer Coaches

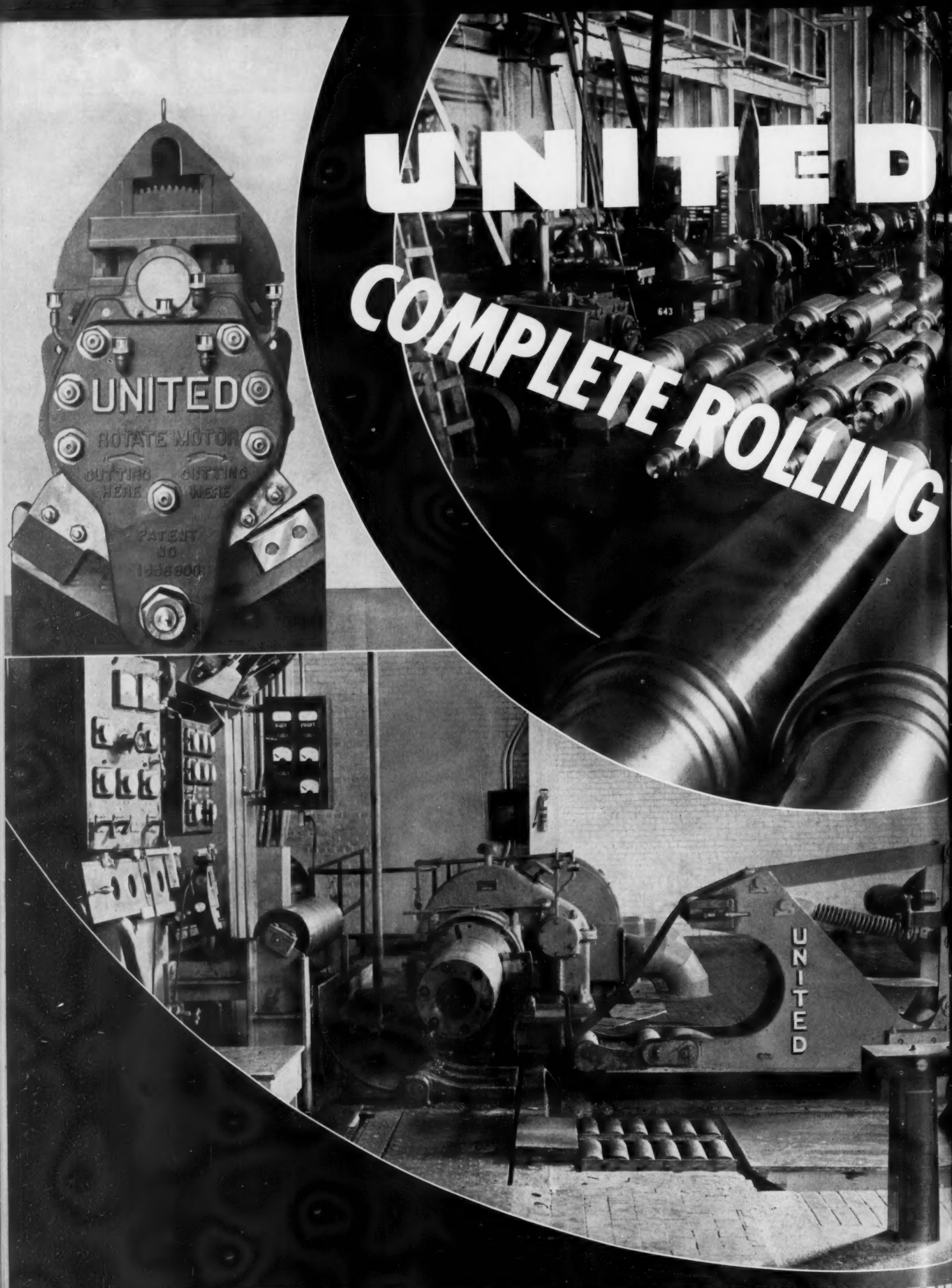
■ Two factors, public demand for safety and dollar value, and recommendations of Fire Underwriters' association, are steadily forcing manufacturers of trailer coaches to utilize steel construction. Most of 22 manufacturers who are members of the Trailer Coach Manufacturers' association have turned to steel chassis, while a growing number have adopted steel in roof construction or are about to do so.

One of this group, Hayes Mfg. Corp., Grand Rapids, Mich., has already placed on the market a new line of safety steel trailer coaches. Three models are included in the line. These have overall lengths of 24½, 22½ and 18½ feet. All are 7 feet wide and incorporate trim styling. Entire body is of unit steel construction, forming one integral unit of chassis, frame, top and skin, electrically welded throughout, as shown in the lower illustration at left. Illustration at right shows an open-side view displaying steel construction and insulation features.

One of the prime difficulties in pioneering this type of construction has been to insulate trailer coach bodies effectively and to prevent condensation or "sweating." This company adopted a cork and asphaltum compound known as Insulmat, which is sprayed on the inside of the steel skin on sidewalls and top to a depth of 3/16-inch. In addition to high insulation value, it is impervious to water and prevents condensation. It also is non-inflammable, odorless, is a preventive of corrosion and rust and a sound deadener.

In addition, a reflective type of insulating material is glued to inside of interior wall and ceiling panelling, facing the Insulmat on the steel and giving complete double insulation. All units also have double floors, with ¼-inch spunglass insulation between.





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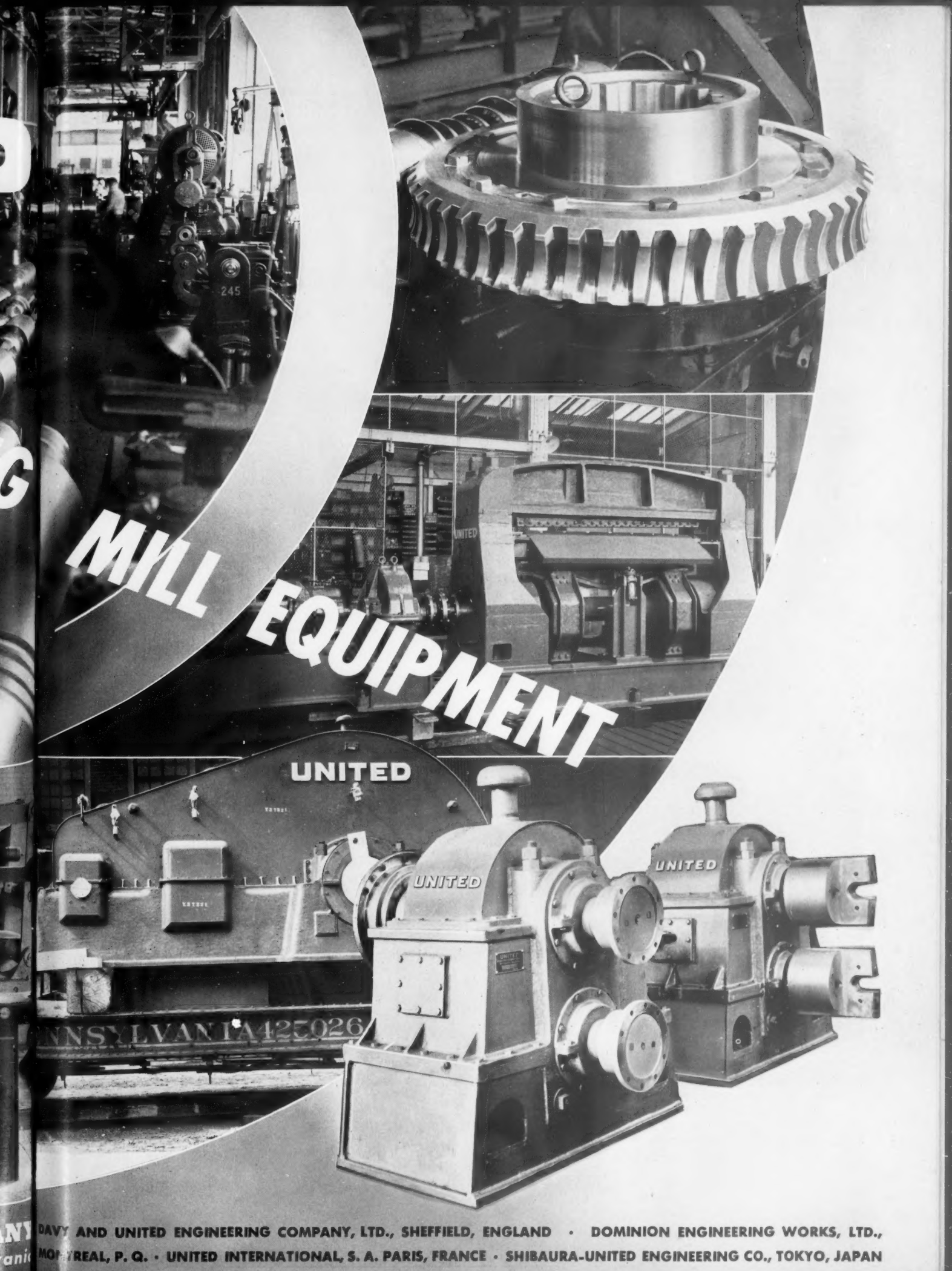


DAVY AND UNITED ENGINEERING COMPANY, LTD., SHEFFIELD, ENGLAND · DOMINION ENGINEERING WORKS, LTD., MONTREAL, P. Q. · UNITED INTERNATIONAL, S. A. PARIS, FRANCE · SHIBAURA-UNITED ENGINEERING CO., TOKYO, JAPAN

Expands Facilities

(*Concluded from Page 64*)

tion results from this method. Mold sections fit together so accurately that joints leave no trace in poured castings.

Cement-bonded sand, besides imparting inherent strength to the mold, is inert to molten metal for all practical purposes. Therefore, in pouring, gases are not generated in mold and castings are free from blowholes, pinholes and surface porosity. Due to its high permeability, steam or vapor resulting from excess water remaining in the mold finds easy exit. Explosions from high velocity gases are absent.

Usually, the mold is entirely destroyed when casting is shaken out. In iron founding, however, certain types of large molds have been known to produce several castings with a little patching. A considerable percentage of the sand shaken out may be salvaged and either used as backing-up sand, as previously indicated, or as rubble to fill in large solid mold sections.

As a result of excellent surface condition of the castings, savings of 25 per cent in machining time are not uncommon.

Electrolytic Manganese Opening Door to New and Unusual Alloys

■ WITH commercial perfection of production methods for supplying carbon-free manganese 99.9 per cent pure, possibilities are seen of of a whole new range of nonferrous and ferrous manganese alloys with unusual properties, according to R. S. Dean, chief engineer, metallurgical division, bureau of mines, Washington, speaking before the Detroit chapter of the American Society for Metals, March 11.

Dr. Dean referred to production facilities of the Electro Manganese Corp., Knoxville, Tenn. (described in STEEL for October 30, 1939, p. 42), now supplying the metal at a price approximating 50 cents per pound. He pointed out that manganese is ten times as abundant in the earth's crust as copper, lead and zinc combined, and that in this country are ores with 20-25 per cent manganese, nominally considered low grade because imported ores used in production of ferromanganese run around 48 per cent manganese.

May Compete with Ferromanganese

The steel industry alone uses in a year some 800,000 tons of manganese and obviously must obtain the metal at a low price. But, as demand for electrolytic manganese increases and refinements in production equipment are made, price of the metal will be reduced considerably to the point where some day it may become competitive with ferromanganese.

Dr. Dean examined the various allotropic forms of pure manganese —alpha, beta, beta prime and gamma, and noted that the gamma form, stable at temperatures above 1160 degrees Cent., can be stabilized with 12 per cent copper, or somewhat smaller amounts of copper and nickel combined, or with nitrogen. Stabilized with alloys, the metal has tensile strength of 55,000 pounds per square inch in the soft condition and, after cold working, 120,000 pounds per square inch, with modulus of elasticity of 23,000,000.

Manganese's allotropism makes it an ideal base for alloys, permitting various types of heat treatment for altering properties. For instance, an alloy of 56 per cent iron, 26 per cent manganese and 18 per cent chromium is readily worked at temperatures of around 1200 degrees Cent., shows somewhat better corrosion-resisting properties than 18-8 chrome-nickel steel, and is hardenable to Rockwell C 60.

Another hardenable alloy is 50 per cent manganese, 40 per cent copper and 10 per cent nickel. Another, with 40 copper, 30 nickel and 30 manganese, has a wide range of hardenability plus exceptionally low heat conductivity.

High-manganese alloys show exceptional vibration dampening capacity under low stress. At the same time they retain their physical properties, some showing as high as 120,000 pounds per square inch tensile strength.

An alloy of 70 zinc, 20 manganese and 10 copper is a good casting alloy and has exceptional toughness, with strength on the order of 100,000 pounds per square inch. Dr. Dean suggested this alloy as a possible better die casting material than some of the brasses which currently are being die cast with varying degrees of success. A feature of manganese in these alloys is that it decolorizes copper, and makes the metal white or silvery in appearance.

Dr. Dean concluded with the observation that while no commercial use of any of these alloys has been initiated as yet, they are being tested in numerous applications and, in the light of the bureau's research with various alloys, would seem to have distinct future possibilities. The alloys are melted in aluminum crucibles in induction furnaces, particular care being taken to prevent the introduction of any carbon or silicon into the melt, since manganese has high affinity for these elements.

Summary of a bureau of mines progress report on "Manganese and Its Alloys," issued last November, appeared in STEEL for Dec. 11, 1939, p. 76.

Ventilating Air Cleaned Electrically at Weirton

■ First steel mill installation of electrostatic air-cleaning apparatus for purifying ventilating air for main drives and motor-generator sets is being completed rapidly by Weirton Steel Co., Weirton, W. Va. This is the first time this method of cleaning air has been used to protect electrical machinery from carbon, copper and other dusts made up of minute particles that are difficult or impossible to remove with mechanical filters.

The Weirton system consists of two Westinghouse Precipitron units, each rated at 72,000 cubic feet per minute and involving one-hundred and twenty 36-inch cells grouped 4 high by 30 wide. One smaller unit is rated at 45,000 cubic feet per minute, and is made up of seventy-six 36-inch cells grouped 4 high by 19 wide. All three units operate at an efficiency of 90 per cent.

Porcelain-Like Metal Finishes Are Marproof

■ Two recently developed metal finishes, Kwickdry and Rockloid, feel and look like porcelain, yet are hard, marproof, will not chip, flake or crack. Introduced by Standard Varnish Works, 2600 Richmond Terrace, Staten Island, N. Y., they are unaffected by mild alkalies and acids and are resistant to most solvents such as aromatic and aliphatic hydrocarbons.

Kwickdry, an air drying finish, is satisfactory for either outdoor or indoor use, while Rockloid, a baking finish, is for indoor use only. The former may be used as a one-coat system or over a primer, sprayed or brushed. It sets tack free in 10 to 15 minutes and dries hard in about two hours. It may be force dried in 20 to 30 minutes at 140 degrees Fahr. The latter may be applied as a one-coat system and baked at 350 degrees Fahr. for ten minutes. For best results a two-coat system is recommended.

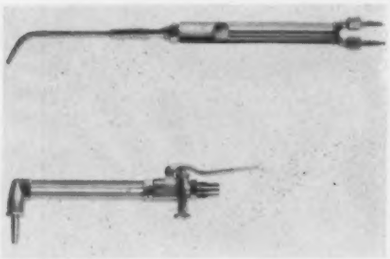
An interesting example of functional design resulting in operating economies as well as streamlined appearance is shown in this photograph of one of the Niagara Streamlined Presses.

Frame design provides strength and rigidity as well as a completely enclosed housing for shafts, gearing, fly wheel, motor, 14-point sleeve clutch. All gears are supported between anti-friction bearings and operate in oil. Write for Bulletin 60-C. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Branches: Cleveland, Detroit, New York. —*Advt.*

Welding Blowpipe and Cutting Attachment

■ The Linde Air Products Co., 30 East Forty-second street, New York, announces a medium-pressure oxy-acetylene blowpipe for welding light gages, and an attachment for cutting iron and steel up to 1 inch in thickness. Blowpipe, Prest-O-Weld W-109, is for welding in light production work and in aircraft construction. It can be used in all applications in which metals up to ⅜-inch thickness are to be joined. Valves are located at forward end of handle where they readily can be adjusted by thumb and forefinger of hand holding the blowpipe. Eight sizes of welding heads are available, each with an individual mixer.

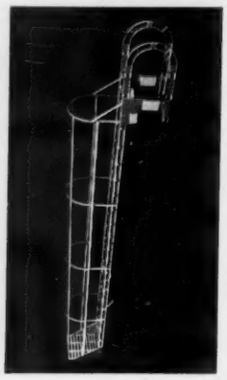
Prest-O-Weld CW-109 cutting attachment attaches directly to the W-109 blowpipe handle in place of welding head. Attachment has improved cutting valve with rubber-



seated stem, and a cutting valve lever that can be turned back 90 degrees to permit ready access to cutting valve assembly. Two cutting nozzles are supplied, No. 0 which will cut iron and steel up to ¼-inch thick, and No. 1, which will cut up to 1 inch.

Overhanging Ladder

■ Aluminum Ladder Co., Tarentum, Pa., has placed on the market an all-aluminum overhanging ladder which enables workmen to get a good foothold on the rungs in climbing up and down. Wooden wearing blocks are fitted to top where it



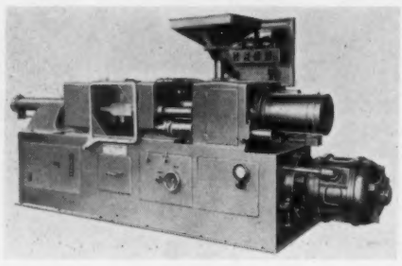
comes into contact with concrete. Guardrail, 22 x 27 inches deep, runs from top to the 22 x 24-inch platform which comprises the bottom. Width of ladder is 22 inches. Weighing only 84 pounds, ladder can readily be carried yet it is strong enough to support three or four men.

Electric Sander

■ Sterling Products Co., 2457 Woodward avenue, Detroit, announced Gyro electric sander. Sander has self-contained, gear driven electric motor and can be plugged into any socket. Flexible sanding pad operates in a movement which simulates hand sanding motion. It operates at 4000 revolutions per minute. Abrasive paper is easily attached to sanding pad and held in place. Sander also can be used for rubbing and polishing, in which case cloths can be attached in like manner. It weighs only 3½ pounds.

Molding Machine

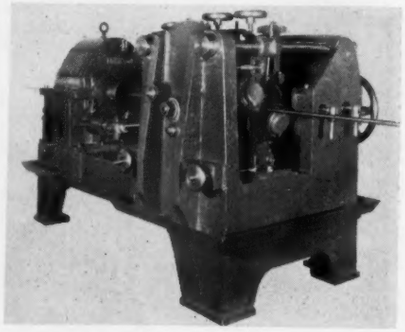
■ Watson-Stillman Co., Roselle, N. J., has developed an improved hydraulic injection molding machine for plastics, devised for faster operation, increased capacity and econ-



omies in operation. Feature is zone heat control which provides distributed heat, giving greater plasticizing capacity to heating cylinder. Large opening (24-inch maximum) between die plates with adjustment of 18 inches on clamping end, allows for accommodation of dies 6 inches thick and up. Two material cylinders are available for use with this machine. Maximum weight of material injected per cycle with 2 3/16-inch cylinder is 6 ounces at 50,000 pressure pounds per square inch. With the 2¾-inch cylinder maximum weight is 8 ounces at 32,000 pounds pressure per square inch. Stroke of injection plunger is 9 inches; speed 150 inches per minute. Machine is arranged for full automatic control. It occupies floor space of 196 x 45 inches.

Straightening, Polishing And Sizing Machine

■ Medart Co., Potomac and De Kalb streets, St. Louis, announces a continuous automatic straightening, polishing and sizing machine for



straightening, polishing and sizing of round bars in diameters of ⅛ to 1-inch in both ferrous and nonferrous materials of any lengths. It may be used on seamless tubes, butt-welded tubes, aluminum, brass, copper bars and tubular products, needle products, hardened pins for power transmission chain, mandrels, drill rods, etc. Bar or tube is straightened by passing in between two rolls set at an angle to each other. Rolling of bar between cross-rolls corrects out-of-roundness and sizes bar from end to end. Rolls also may be used for polishing surface of bar or tube simultaneously with straightening and sizing action.

Power Rectifier

■ Cassels Engineering & Machine Co., Wauwatosa, Wis., announces line of Porto-Rect alternating-current to direct-current portable commercial power rectifiers for industrial use. "Tailor-made-to-the-job" is a special feature. These units require no special wiring and will furnish direct-current power from any alternating-current outlet. Adjust-

(*Please turn to Page* 78)

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Slabber-Edger Setup

(*Continued from Page 49*)

mum opening of 11½ feet and can be reduced to 24 inches.

A unique turnaround is incorporated in tables 3 and 4. Here alternate rolls are connected to separate drives on opposite sides of the tables. Adjoining rolls are tapered from opposite ends. When these two groups of oppositely tapered rolls are driven in opposite directions, an ingot on them is turned around any amount desired. When turning action is started, ingot pivots on its center regardless of its size or location on the table.

Rolls taper 1 inch on their 11½-foot length, being 18 inches in diameter at one end and 17 at the other. Rolls are on 21½-inch centers. This is believed to be the first installation of tapered turnaround rolls on slabbing mill delivery tables. Their use eliminates necessity of a broadside mill as it enables the slabbing mill to roll both lengthwise and crosswise the ingot. Turning action is extremely fast, and it is easy to position ingots accurately.

Control pulpit is directly opposite and elevated above table 4. As shown in Fig. 1, two operators are provided with convenient foot and hand controls. Not shown are overhead controls also within easy reach. Operators are protected from radiated heat by new heat-absorbing glass.

Operator at right, Fig. 1, usually handles slabber screwdown and edger setting with the helper operating delivery tables and sprays. Large-dial Selsyn indicators show settings of slabber and edger. A complete intercommunicating system is provided between all four control pulpits in the mill. Second pulpit is opposite the scarfer and third is opposite the shear with fourth unit at charging side of reheating furnaces. Working conditions at all four are greatly improved by recently developed heat-absorbing glass windows.

An electric eye on table 6 feeding the transfer is connected with an indicator in the pulpit opposite table 4 to check temperature of the material.

Considerable fuel economies are obtained in this plant by **not** allowing the slabs to cool to room temperature before being fed to the reheating furnaces ahead of the hot mill. However, this prevents any conditioning work being done by hand, so an oxyacetylene scarfing unit is placed between tables 7 and

Table I—80-Inch Hot Strip Mill

Stand	Gear Ratio	Roll			Motor			
		Dia.	R.P.M.	F.P.M.	H.P.	R.P.M.	Volts	Type
R1-2Hi	34.6–1	34″	17.35	154	1000	600	6600	Ind.
E2	21.97–1	...	....	...	250	400/800	....	D.C.
R2-2Hi	30.6–1	34″	16.8	149	2500	514	6600	Ind.
E3	15.30–1	...	....	...	250	400/800	....	D.C.
R3-2Hi	12.7–1	34″	31.5	280	4000	400	6600	Syn.
E4	10.14–1	...	....	...	250	400/800	....	D.C.
R4-4Hi	8.1–1	20″	74.1	389	5000	600	6600	Syn.
E5	10.14–1	...	....	...	150	360/720	....	D.C.
R5-4Hi	5.31–1	20″	75.3	395	4000	400	6600	Syn.
F1-4Hi	4.10–1	20″	43.9/87.8	230/460	3000	180/360	600	D.C.
F2-4Hi	3.04–1	20″	57.5/115	301/602	4000	175/350	600	D.C.
F3-4Hi	1.87–1	20″	93.5/187	490/980	4000	175/350	600	D.C.
F4-4Hi	1.38–1	20″	130.5/261	684/1368	3000	180/360	600	D.C.
F5-4Hi	1.05–1	18″	171.5/343	810/1620	3000	180/360	600	D.C.
F6-4Hi	Direct	18″	180.0/360	850/1700	3000	180/360	600	D.C.

Note: 600-volt D. C. power from three 4000-KW 3-unit sets; 6600-volt supply is 3-phase 60-cycle. Flywheels on stands R-1 and R-2 have 40,000 and 60,000 HP-seconds respectively. All rolls are 80 inches long. Maximum width rolled is 74 inches.

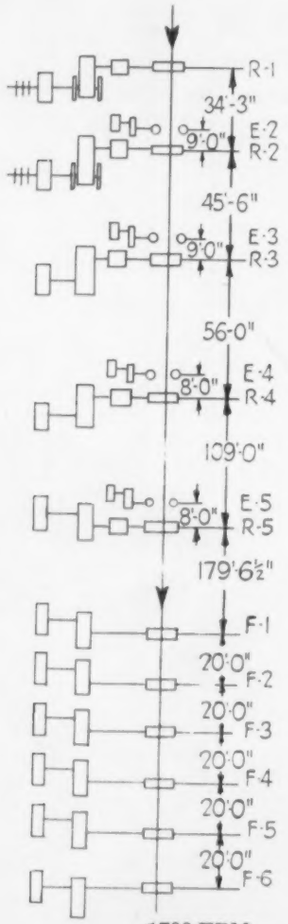
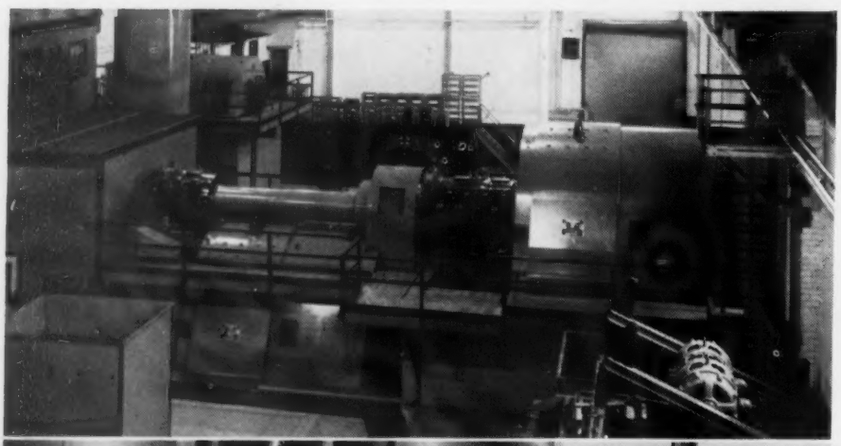


Fig. 5. (Left)—Lineup of stands in hot mill. Table 1 gives data on rolls, drives, etc.



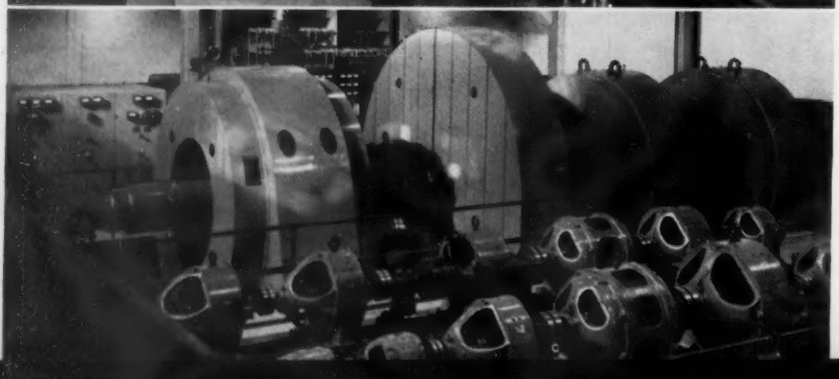


Fig. 6. (Upper)—Two 5000-horsepower motors for slabber are shown here, offset one above the other. Slabber is through wall at left. Back of control pulpit extreme upper left

Fig. 7. (Lower)—Big motor-generator set drives both slabber and edger motors. It includes a 7000-horsepower induction motor, 100-ton flywheel and three 3000-kilowatt direct-current generators

8 following the transfer table. See Figs. 2, 3 and 10.

Operation of the scarfer, feed tables and slab turnover on table 8 is controlled from pulpit opposite the scarfing unit. Slab first is positioned on table 7 with one end just over the scarfing head and acetylene turned on to preheat the slab for scarfing. No pilot burners are necessary as the acetylene is ignited from the slab. After preheating for 10 seconds, oxygen is turned on and tables actuated to pass the slab over the scarfing unit. A 3/32-inch layer of material is removed from the bottom surface of the slab as it travels over the scarfer at about 135 feet per minute. On another grade of material, 1/16-inch is removed at 160 feet per minute.

After turning over on table 8, slab is returned to table 7 for conditioning the opposite side. As shown in Fig. 2, scarfing is done only as the slab passes from right to left over the scarfing unit from table 7 to 8. Scarfing head is mounted on wheels and rails, permitting it to be rolled out from under the table line for adjustment and maintenance.

Head Surfaced with Stellite

Top of scarfer head is surfaced with stellite for maximum resistance to wear as the entire head is floated up against the bottom side of the slab, permitting it to follow contour of the slab to assure proper scarfing action. Top of scarfer is water cooled.

A chute immediately to the right of the scarfing head, Fig. 2, collects granulated slag melted and blown off the slab and deposits it into buggies for easy removal by overhead crane. Scarfing head contains eight groups of eight nozzles, each group being replaceable as a unit.

Nozzles are 1-inch diameter, spaced 1 3/16 inches from center to center, each nozzle being drilled as shown in lower part of Fig. 2. Eight holes made with a 59 drill are provided in each tip for the acetylene. Central slit for oxygen is ½ x ⅛-inch. Individual valves for each nozzle permit correct adjustment of oxygen and acetylene.

Scarfing is done at 14 pounds acetylene pressure and 50 pounds oxygen pressure. Gas consumption averages around 103 cubic feet of oxygen and 1.45 pounds of carbide

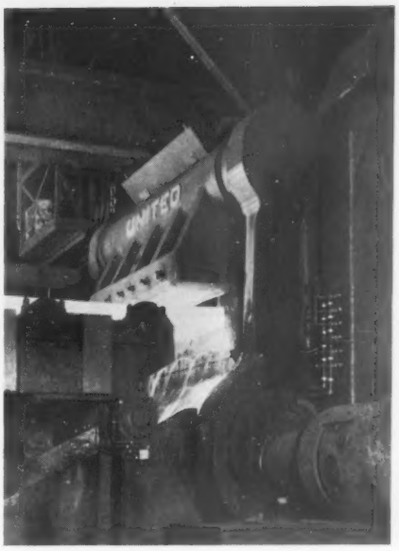


Fig. 8—New down-and-up-cut shear just ahead of holding furnaces

(6.525 cubic feet acetylene) per ton of slab.

Maximum width which can be scarfed is 76 inches. For narrower slabs, burners are turned off to cover only the width required.

Gas for the scarfer unit and other operations around the plant comes from equipment in small adjoining supply buildings. In one are four 50,000-cubic foot oxygen converters which change liquid oxygen to gas. The liquid oxygen at 296 degrees below zero Fahr. and at atmospheric pressure is drawn through steam heaters which feed it in gaseous form to the mill system at 125 pounds pressure. Tank trucks bring to the plant about 500 gallons of liquid oxygen per load, enough to furnish 100,000 cubic feet of oxygen.

Oxygen and acetylene gases are piped around the mill through complete piping systems with about 5000 feet of pipe in each system.

Acetylene is generated in a separate building which houses two 1000-pound generators. Carbide in a hopper over each unit is delivered to the generator by a water motor automatically. Acetylene is generated at a pressure of 7 inches of water and is fed to a large holder, the position of which automatically controls the water motors and rate of gas generation. From the acetylene holder, pressure is boosted to 14 pounds for distribution throughout the plant.

Slab shear, Fig. 8, is a new down-and-up-cut unit which employs individual 250-horsepower 250-volt direct-current motors at 425 revolutions per minute to drive upper and lower blades separately. Upper blade can be brought down near the slab which then is sheared by lifting the lower blade. Also, the lower blade can stand still and slab be sheared by passing down the upper blade. Electrically operated guides are provided on entry side.

Table 10 on exit side can be moved back to permit cropped ends to drop into a chute leading to a scrap bucket below. Scrap buckets are lifted from well and dumped di-

(*Please turn to Page* 84)

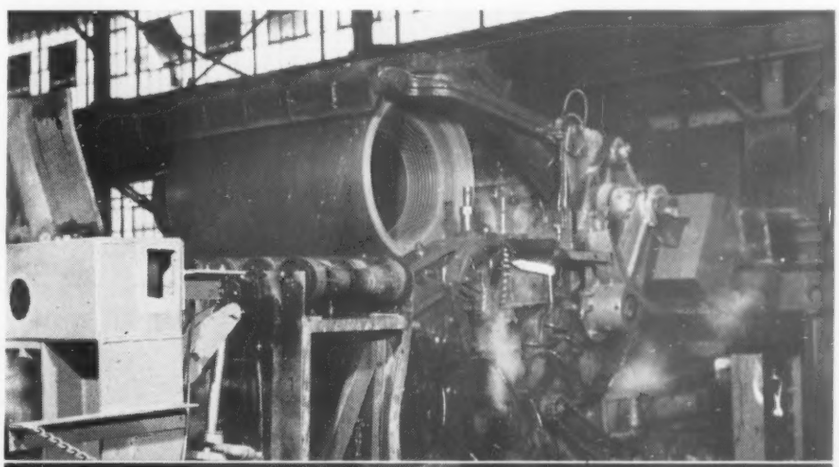


Fig. 9. (Upper)—One of two revamped coilers at the far end of the 363-foot runout table

Fig. 10. (Lower)—Flame scarfing under side of a slab as it passes over the scarfing head

New Equipment

(*Continued from Page 74*)

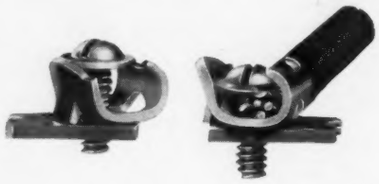
able speed controls for direct-current motors and operation of magnetic devices is their greatest field. They are designed in sizes from 12 to 200 amperes output at any standard voltage.

Thermostats for Electric Appliances

■ Westinghouse Electric & Mfg. Co., Mansfield, O., has announced two thermostats—Sentinel for roasters and water heaters, and Guardsman, for use in ironing machines. Bi-metal of Sentinel does not carry current, it acts as a switch when turned to low position. It has an adjustable range from 32 degrees to 450 degrees Fahr. and a maximum rating of 15 amperes at 115 volts, and 10 amperes at 230 volts, alternating current. Guardsman with its slow make and break is for general applications. Its rating depends upon type of service for which it is used. It is adjustable over a range of approximately 250 degrees Fahr. with a maximum alternating-current rating of about 7.5 amperes at 115 volts. These thermostats have no direct-current ratings.

Solderless Connecter

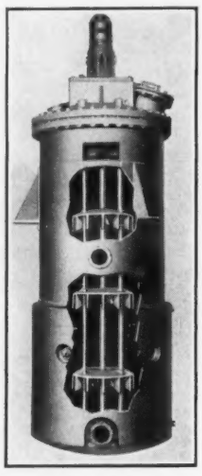
■ Square D Co., 6060 Rivard street, Detroit, has introduced universal solderless connector which saves time in wiring applications. Con-



nector is free to rotate around the screw, allowing wire to be inserted from almost any angle. Because it can accommodate No. 14 to 4 wire, it permits use of large wires for service drops to small 30 or 60 ampere switches. Connector is self-centering, and lug is tightened by a screw.

Gas Absorber

■ Patterson Foundry & Machine Co., East Liverpool, O., has developed a line of gas absorbers which are built of stainless steel and

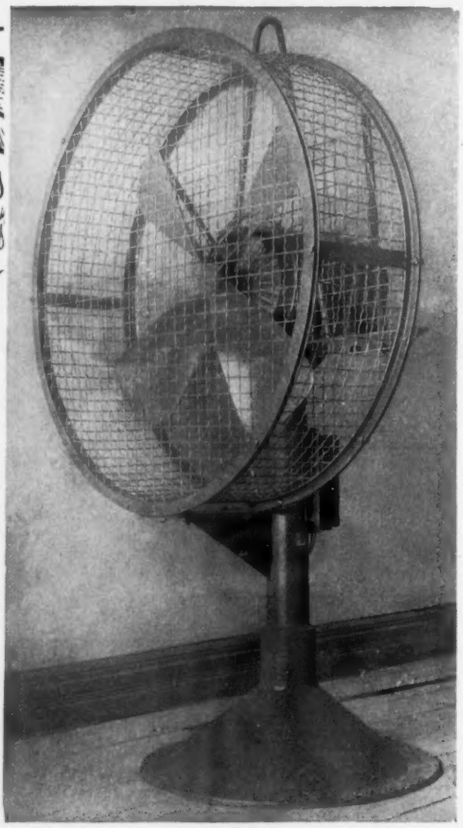


equipped with Unipower agitator drive. Machine dimensions are 3 x 7 feet, designed for 60 pounds internal pressure and 100 pounds jacket pressure. Each is fitted with three 12-inch gas absorber turbines. They are also available in a variety of nonferrous metals and a wide range of sizes.

Tilting Wood Saw Bench

■ Oliver Machinery Co., Grand Rapids, Mich., offers No. 260 double arbor tilting wood saw bench. Saw has two arbors, one carrying a 16-

HEAT INSIDIOUS THIEF OF MANPOWER



■ The sweat shop is damned by every honest employer as well as every honest worker—but what about "sweat shops" in a literal sense? Even in plants that are models for labor relations the most willing worker slows up when the heat gets him. You can keep your men cool with the TRUFLO MANCOOLING PORTABLE FAN. Leading steel plants use these fans in and around skelp furnaces, bar mills, tube mills, heat treating furnaces and other localities where intense heat wears men down—wears 'em down and lets them draw full pay for little better than half time. The psychological effect is sound, too; look after your men's comfort and they'll make better workers. A complete line of cooling fans, blowers, exhaust fans and wall fans.

Write at once for information

TRUFLO COOLING FANS

TRUFLO FAN COMPANY

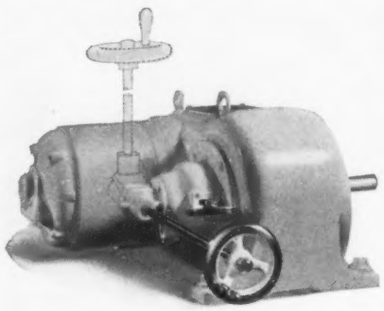
HARMONY, PENNA. (Pittsburgh District) Phone: ZELIENOPLE 293

inch diameter rip saw, the other carrying a 16-inch diameter crosscut saw. Either can be brought into operation by means of a hand wheel

in front of machine. It will rip wood 26 inches wide with type E ripping fence, cut off 36 inches wide. The 16-inch saw projects through the table 3¾ inches. Base is made in cored form with strong flange for ample floor support. Table is 41½ x 44½ inches, composed of stationary and rolling section.

Remote Control

■ U. S. Electrical Motors Inc., 200 East Slauson avenue, Los Angeles, has introduced a new single right-angle mechanical remote control for its Varidrive motors. Control permits selecting operating speed of



motor when it is mounted beneath or above driven machine or is inaccessible. Helical right-angle gears permit control shaft to be extended at a 90-degree angle in any of eight directions.

Versatile Air Vise

■ Larkin Air Vise Co., Portland, Conn., has designed an air vise for production machine work. It is adaptable for bench work, milling, shaping, planing, drill press work and other machine shop and tool room operations.

Castings are semisteel and machined parts are accurately made. Vise is available in five sizes ranging from 4 to 8 inches in jaw width. It is supplied with hardened and ground jaws, flanged base and hand-operated control valve. Special jaws, swivel and universal bases and foot-operated valves also are available.

Multipurpose Tool

■ H & H Research Co., 1925 West Buena Vista, Detroit, announces Hoover Multi-Purpose tool weighing 1 pound which hones, files, chips, burrs and saws and is suitable for use on dies, patterns, plastic molds and special machine production. Operating with a reciprocating movement, tool is powered with 110-volt motor and only operates when control button is depressed. Standard equipment includes 6-foot cord to be plugged into any standard 110-volt (25 to 60-cycle) line. Provision is made for 220-volt current when required.

Milling Machine

■ Kent-Owens Machine Co., Toledo, O., has announced a milling machine with a horizontal spindle and verti-

New, Easy Way to Replace Gaskets!

FLANGE-JACKS

You can replace gaskets in flanged pipe lines easier, quicker and safer than ever before by using Flange-Jacks—a new tool now introduced by Garlock.

That difficult job becomes a most simple operation when you let Flange-Jacks do the work. Even if a joint is located where working space is cramped — making it hard to use hammers and chisels—Flange-Jacks will open it easily. Send coupon below for folder.

To operate Flange-Jacks:
Remove opposite flange bolts, insert jaws of Flange-Jacks in holes and tighten. After removing other bolts, tighten down jackscrews together, separating flanges evenly.

NO HAMMERS, NO CHISELS, NO WEDGES

No Broken Flanges • No Damaged Faces • No Pipe Vibration • No Dangerous Sparks • No Long Shutdowns.

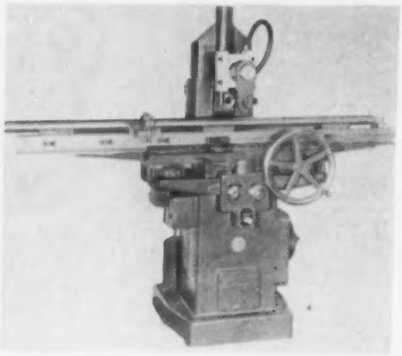
THE GARLOCK PACKING COMPANY,
Palmyra, N. Y.
Please send descriptive folder on Flange-Jacks.

Name.....
Company.....
Address.....
S 3-40

THE GARLOCK PACKING CO.
PALMYRA, NEW YORK
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

GARLOCK

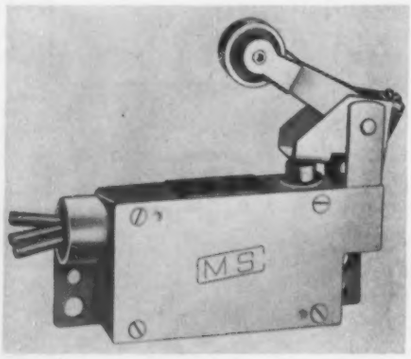
cal feed to head suitable for milling Woodruff keyways and performing similar operations on long parts.



Extra long table is provided to furnish support for work throughout its entire length. Table is advanced lengthwise through a rack and pinion by means of large hand wheel. Dogs are used with quick-acting flag stop to position work for each successive keyway. Vertical movement of head is entirely automatic, being controlled hydraulically. Machine is driven by standard foot mounted motor mounted at rear. Between motor and cutter there are only two gear contacts, one of which is a pair of pick-off gears providing a spindle speed range of 100 to 1335 revolutions per minute. An infinitely variable feed rate ranging from ¾ to 80 inches per minute can be obtained. Changes in feed rate are obtained by adjusting dials at the front of the machine.

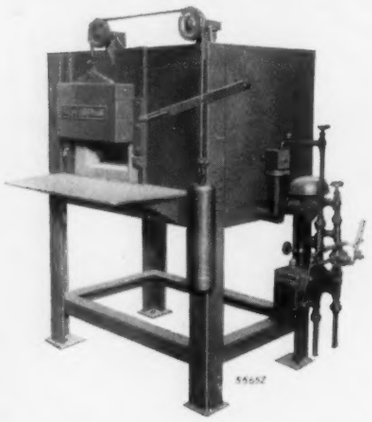
Precision Limit Switch

■ Micro Switch Corp., Freeport, Ill., announces LK-2 precision limit switch for actuation by rotating or sliding cams. It has a roller actuator that is adjustable through an arc of 225 degrees. Switching element contained in steel housing is a single-pole double-throw contact arrangement. LK-2 has a movement differential at the roller of 0.002-inch, a pretravel of 1 degree, an overtravel of 20 degrees and an operating pressure of less than 1.8 pounds. Interchangeability is possible because operating point is held within plus or minus 0.002-inch with relation to mounting dowels. It is resistant to oil and water and rated at ½-horsepower up to 460 volts, alternating current.



Furnace for Heating Rock Drill Bits

■ Ingersoll-Rand Co., Phillipsburg, N. J., announces Jackfurnace for rapid heating of detachable rock drill bits. Furnace can be used with either jackmills (hotmills) or grinders and also for heating shanks and rod ends for hardening.



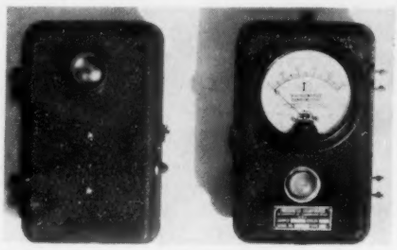
Low-pressure air from an induction blower passing through a preheating chamber aids combustion. Convenient controls enable operator to attain proper mixture of oil and air. Furnace can be equipped with an automatic temperature control device and will handle 180 jackbits per hour. Standard equipment includes loading spoon and unloading device.

Wide-Vision Goggle

■ Chicago Eye Shield Co., 2304 Warren boulevard, Chicago, offers improved No. 220 Wide-Vision goggle which has a full 150-degree range of vision. Hardened safety lenses provide maximum protection against severe impacts. Both lenses are easy to renew, by sliding them through outer side of each eye-cup. Feature is one-piece cushion pad, composed of pliable material highly resistant to perspiration. Pads are said to conform to varying contours of practically every wearer, seating each eye-cup comfortably. Additional ventilation holes in rust-proofed metal portion of eye-cups increases cool air circulation. Nose bridge is adjustable to varying facial widths.

Smoke Alarm

■ Photoswitch Inc., Cambridge, Mass., has developed an electric eye smoke alarm with densometer which continuously observes smoke passing through the flue. It indicates smoke density on a 4⅜-inch dial which reads from 0 to 100. Equipment is so set that a large red signal light indicates when smoke density exceeds a predetermined value consistent with efficient combustion. Light source and photoelectric control are mounted on opposite sides of flue or breaching, and are aligned through simple entrance tubes so beam projected from light source strikes eye of control. Densometer may be placed at any convenient location in the boiler room, usually near the other furnace controls, and is wired to the photoelectric control. Equipment is supplied in dustproof housings.



Roller Bearing

■ Shafer Bearing Corp., 35 East Wacker drive, Chicago, announces double-row roller bearing available in DE 200 series, sizes from 3.1490 to 5.9045-inch bore; and DE 300 series, sizes from 1.9680 to 5.1171-inch bore. The DE series is a self-contained double-row angular contact type. Concave rollers operate between convex races, one piece outer race having two ground raceways. Concave roller design provides self-alignment within bearing itself, and capacity for radial loads, thrust loads in either direction, or any combination of radial and thrust loads.

Stressproof News

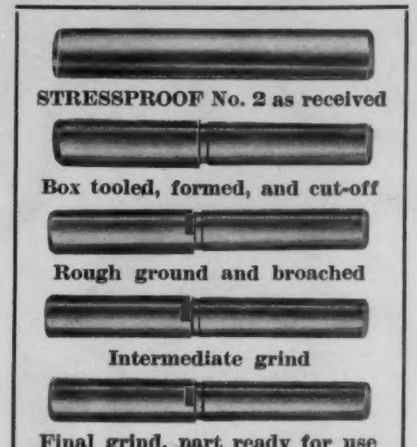
T. M. REG. U. S. PAT. OFF.

Presenting News of a New Cold Finished Steel Bar

By LA SALLE STEEL COMPANY — Chicago, Illinois

EXTRA ! Manufacturer saves 4 cents per part by replacing SAE X-1020 case hardened, with STRESSPROOF No. 2 for pump shafts on gasoline engine driven farm units.

Only Four Operations Required To Prepare Part for Use



STRESSPROOF No. 2 as received

Box tooled, formed, and cut-off

Rough ground and broached

Intermediate grind

Final grind, part ready for use

By using STRESSPROOF No. 2 in place of SAE X-1020, the maker of the water pump shaft shown above reduced the number of essential production operations to four, eliminating copper plating on ends, wire brushing, case carburizing and straightening. Full story below.

FIRM SAVES 2½c EACH ON WATER PUMP SHAFTS

Replaces Carburized SAE X-1020; Record Proves Wearing Qualities

One of the most dramatic of recent demonstrations of how a switch in steel grades can save time and money without sacrificing quality has come from a well known manufacturer of water pump shafts. To obtain needed wearing qualities, this firm had been using case carburized SAE X-1020. As a result, operations like copper plating the ends, wire brushing, carburizing and straightening were necessary production steps.

A trial of STRESSPROOF No. 2 disclosed that with this new bar steel all operations, other than those essential to machining the shafts, could be eliminated. Possessing excellent wearing qualities **right in the bar as received,** STRESSPROOF could safely be put into service without case carburizing or other subsequent operations. As proof of this point the manufacturer offers the highly satisfactory service already recorded for the STRESSPROOF shafts. Actual use has shown them easily the equivalent in wearing qualities of the

(Continued on page 2, Col. 2)

Manufacturer Reports Big Cut in Machining Costs with New Steel

Abart Replaces H.T. 1045 For Speed Reducer Shaft; Increase In Quality Is Also Reported

A recent report from the Abart Gear and Machine Company, well-known makers of speed reducers, gears and similar products, tells of an interesting improvement in the quality of their products by using a new bar steel, STRESSPROOF.

Up until a few months ago, this company had been experiencing difficulty in machining speed reducer power take-off shafts. The steel being used, SAE 1045, heat treated, cut slowly and was unusually hard on tools.

After thorough investigation of the possibilities, a trial of STRESSPROOF was made and this trial convinced them of the existence of a steel which would not only aid in solving their machining problems but would also increase the quality of their finished product. (The test showed that the physical properties of the shaft were improved when made from STRESSPROOF and the wearing properties superior to Heat Treated SAE 1045).

Abart shopmen have given the switch to this new steel their hearty approval. They are well agreed that the various machining operations on STRESSPROOF are easily 80% of SAE 1112 machining speeds—a considerably higher rate than could be attained with the grade formerly used. Cost records disclose that the savings in tool life alone around one cent per pound of steel machined.

But by no means was this the only cost saving. For, in addition to superior cutting qualities, STRESSPROOF eliminated all need for heat treating. Possessing more than sufficient strength in the bar as received, no furnace treatment, cleaning or straightening of any kind was required. Furthermore, the finish of machined parts was reported just as good as that of any steel ever used in the Abart shops, including low cost, free machining, low strength grades.

As a result of obtaining all these advantages, this firm's purchase orders for steel intended for speed reducer power take-off shafts now read "STRESSPROOF" consistently.

How One STRESSPROOF User Describes This New Steel

One of the many enthusiastic users of STRESSPROOF Cold Finished Steel bars recently offered his definition of this remarkable material: "You can usually judge a steel by these four qualities—Strength, Freedom from Warpage, Machinability, Wearability. STRESSPROOF is a steel in which all these desirable qualities have been retained. Although there has been a slight sacrifice in maximums, not one of the desirable qualities has been eliminated. Other steels may offer protection in one quality, but at a complete sacrifice of one or more of the other desirable qualities."

Above: **Cut-away view of Abart Speed Reducer.** *Below:* **Close-up of power take-off shaft used in Speed Reducer. Shaft is machined from STRESSPROOF No. 2 at large savings.**

When Not to Use STRESSPROOF No. 2

STRESSPROOF No. 2 by reason of its unique wearing qualities can be substituted for case carburized steel in many applications. It should be noted, however, that STRESSPROOF No. 2 has a Yield Strength of 100,000 lbs. p.s.i. minimum, and therefore, is not suitable for parts case carburized and subjected to high unit pressures and severe Brinelling action.

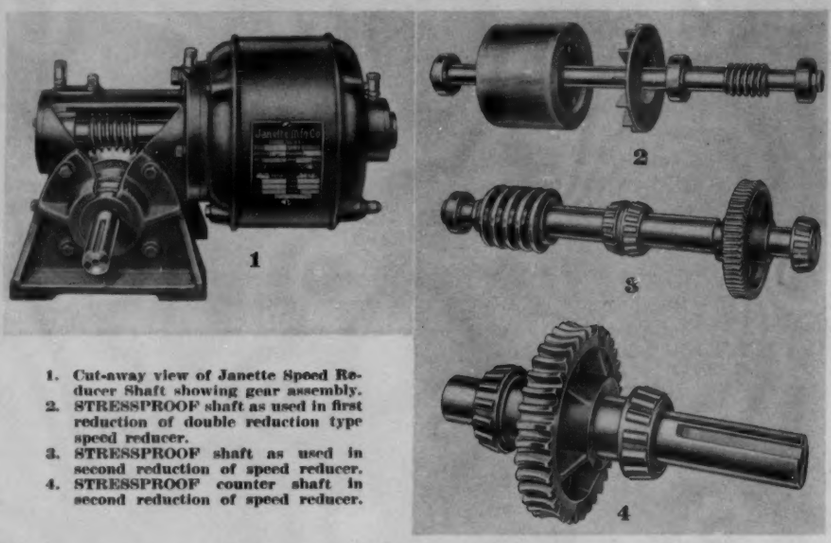
NEW STEEL REPLACES HEAT TREATED ALLOY

Janette Mfg. Co., Standardizes on STRESSPROOF for Shafts

How a switch from the grades of steel formerly used yielded large savings in the cost of parts was recently disclosed by Janette Mfg. Co., a prominent manufacturer of electric motors, speed reducers and related equipment. Shafts for use in motors ranging from 1/50 to 10 horsepower, for example, were formerly made of heat treated SAE 3140. As now made of STRESSPROOF these parts are produced to the high Janette quality standards at substantially lower costs. These lower costs, Janette engineers say, result from a combination of a higher degree of machinability, elimination of straightening operations (because of minimum warpage), and a medium material price.

Another cost-saving application to which Janette designers put STRESSPROOF was speed reducer counter shafts. The major requirement in the case of these parts, handling torques from 6 pound inches up to 29,350 pound inches, was for adequate strength. STRESSPROOF, with strength equal to many heat treated steels, was more than equal to the job.

This manufacturer further reports substituting this new steel bar for SAE 4615, case carburized, for spur and helical gear pinions at "important savings in freer machining, elimination of carburizing, and maintenance of high quality."



1. Cut-away view of Janette Speed Reducer Shaft showing gear assembly.
2. STRESSPROOF shaft as used in first reduction of double reduction type speed reducer.
3. STRESSPROOF shaft as used in second reduction of speed reducer.
4. STRESSPROOF counter shaft in second reduction of speed reducer.

Maintenance Engineers End Worries with STRESSPROOF

"What kind of steel ought to be used to replace that broken shaft?"

"How can I avoid heat treating these repair parts?"

"How to speed up repairs on replacement parts?"

"Can't we cut down on those high priced alloys?"

These are typical of the dozens of problems constantly plaguing the men in charge of a plant's repair division. They are problems solved quickly, and usually at savings in costs, by maintenance engineers who have access to STRESSPROOF No. 2.

In this steel bar they obtain in a single grade, **right in the bar**, sufficient strength and wearability for most applications and so avoid costly heat treating, case carburizing, and subsequent operations. In addition, they get fast machining, cut down-time to a minimum, and have little or no trouble with warpage, either in machining or with the parts in service, not to mention the advantage of stocking only one grade of steel instead of four or even more.

Firm Saves 2½¢ Per Shaft; Replaces Carburized SAE X-1020

(Continued from page 1, Col. 1)

case carburized steel formerly used.

This manufacturer unquestionably would echo the apt expression of another enthusiastic STRESSPROOF user who recently described this new steel bar as: "Ready to machine as received, ready to use after machining."

Besides eliminating several costly operations, the use of STRESSPROOF also afforded vastly improved machinability. More than that, it machined with practically no warpage. All told, the savings, despite a slightly higher initial material cost, are averaging about 2½ cents per shaft. Multiplied by the number of shafts the manufacturer turns out in a year (he supplies parts for a wide variety of firms in the automotive, truck and tractor fields), these savings will amount to a handsome annual saving in production costs.

The experience of this firm with STRESSPROOF is not at all unusual. Wherever this steel is applicable, its unique combination of "in-the-bar" qualities cannot help but produce worth-while savings.

Tough Warpage Problem Solved by Manufacturer

Constantly recurring difficulties in producing true, straight shafts with X-1314 steel led a well-known manufacturer to undertake an intensive search for another grade. The shafts are high speed drilling and tapping spindles for use in high speed drill presses. When made of X-1314 it was necessary to salt bath case harden the shafts, a step which produced great distortion and made necessary complicated and costly straightening.

The manufacturer's search for a more satisfactory steel ended when STRESSPROOF No. 2 was put to the test. The use of this steel, with its excellent wearing qualities **right in the bar**, eliminated all need for case hardening and subsequent straightening and cleaning operations. And so little distortion was experienced during machining that shafts were ready for immediate 3,000 R.P.M. service without further operations.

Machinability of STRESSPROOF was found to be about equal to that of the former steel. Broaching and splining was reported as excellent. And the net result was a finished part of equal, if not superior, quality at a considerably lower cost.

La Salle Steel
La Salle STEEL COMPANY
Manufacturers of the Most Complete Line of Cold Finished Steel Bars in America
Address:
Dept. 3A, Box 6800-A
CHICAGO, ILLINOIS

Hi-Tensile Steel Ships

(*Continued from Page* 58)

pounds per square inch, a mild steel being reduced from 31,200 to 27,000 pounds per square inch. This also shows high tensile steels are more sensitive to notch effects than mild steels.

Notch effect in welded joints also was extremely important due to irregular surface of unfinished weld metal. Presence of unfinished welds in high-tensile steels was found to reduce fatigue strength from 32,000 to 21,300 pounds per square inch and in mild steels from 31,200 to 25,000 pounds per square inch. This also confirms the conclusion that influence of notch effect is considerably greater in high-tensile steels than in mild steels.

In seeking means to increase fatigue resistance it was found that filling in the groove exactly even with adjoining plate surfaces and depositing a smoothly flowing surface on completed weld produced greatly enhanced fatigue properties. However, fatigue strength of an unfinished weld remained considerably below that of the finished weld due to the notch effect. Finishing a welded seam with a coarse grinding wheel causes sharp grooves in the material, giving rise to strong notch effects and early fatigue failure. Filing of the weld is far better, while machine tooling is much to be preferred. That notch effect of an undercut groove next to the weld is the cause of fracturing has been demonstrated over and over, so must be avoided carefully.

Withstands Greater Stress

Considering purely *dynamic* stress, fatigue strength, of high-tensile steel appears little greater than that of mild steels while fatigue strength of unfinished welds in high-tensile steels is even below that in the mild steels because of the greater notch effect.

The question arises then, why use high-tensile steel in practical welded construction subject to repeated stresses such as in ships? The answer is that because of the higher yield point and greater tensile strength, the material will withstand much greater stress variations than ordinary mild steel when subjected to combined static and dynamic stresses.

Fatigue tests made with a flat bending machine with specimens to *combined static and dynamic* stresses give the interesting results shown in Table IV.

A typical series of tests showed that with static tension of 28,500 pounds per square inch, for instance, the welded joint in mild steel can withstand added dynamic stress of about 7100 pounds per square inch. However, welded joint in high-tensile steel under same conditions can withstand addition of 12,800 pounds dynamic stress. When high-tensile steel weld is loaded to 35,500 pounds per square inch static load, a dynamic stress of about 8000 pounds per square inch can be taken care of easily whereas with mild steel the yield point already is reached.

These tests indicate use of welded high-tensile steels in shipbuilding work without doubt offers important advantages. Part II of this abstract to be presented next week details applications and some interesting details of best practices, types of ship constructions, etc., especially developed for welded naval ships.

(*Concluded Next Week*)

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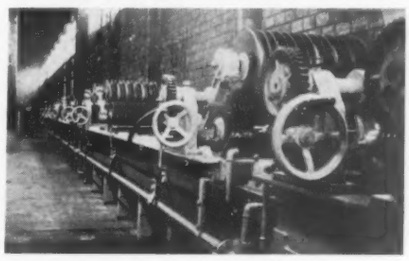
Process Galvanizes 50 Per Cent Faster

■ Wires and shapes can be covered with tin, lead, copper, brass, nickel, cadmium or other metals and alloys 50 per cent faster and at a saving of approximately 40 per cent by use of the Marino process, it is claimed.



Electro-galvanizing unit in operation in an English plant. Note compactness and cleanliness of this straightline cleaning, pickling and coating process

Development which has proved successful in England under rigid mill production conditions, incorporates electrocleaning, pickling and galvanizing in an entirely automatic cycle.

Since no heat is used in this process, zinc is not oxidized, no dross is formed and zinc need not be kept in molten condition when the mill is closed for weekends or other shutdowns.

George D. Hartley, consultant, Worcester, Mass., is in charge of licenses or sale of the process in United States and Canada.

Grinding Disk Resists Friction-Generated Heat

■ Ability to withstand high temperatures generated in grinding features Silver-Streak insulated grinding disk fabricated by Abrasive Products Inc., South Braintree, Mass. Heat resistance of product results from a new binder which stays firm and holds grits in cutting position at temperatures up to 1800 degrees Fahr.

Disk also possesses an advantage in its coating; laboratory tests have shown its special aluminum oxide grit capable of heavy work.

Platinum-Clad Metals

(*Concluded from Page* 55)

of various shapes. Seamless tubing can be made readily. When platinum and platinum-clad metals are fabricated in presses and on the lathe, the metal will be found to behave much like soft copper. Thus when punching, machining or turning operations are involved, the same general practice is used as with pure copper.

Welding of platinum and its alloys can be accomplished either electrically or with a gas flame. It is a rather simple operation to weld two pieces of platinum by hammering them together at a bright red heat. Greater care must be exercised, however, in welding platinum-clad material as the lower melting point of the base metal may result in diffusion of the metals into each other, thus reducing resistance to corrosion at the joint.

Soldering platinum and its alloys is often done with fine gold. However, many factors influence the choice of a proper solder, such as melting point, flowing qualities, hardness and resistance to various reagents.

Palladium and its alloys are quite similar to platinum in working characteristics except that lower annealing temperatures may be used. In spinning and forming, palladium will be found to have more "drag" than platinum. For this reason, palladium often is previously hardened with small quantities of other platinum-group metals when used for such applications.

With increased supplies of platinum and palladium available at a more stable price and development of practical cladding methods in conjunction with more adequate research in applying these metals, it is expected their use may experience an important expansion. Already these metals have established a reputation for resistance to heat and severe corrosion, so increased use is anticipated in such applications as agitators, liners, stills, filtration equipment, storage tanks, heating and cooling tubes, gaskets, sleeves, settling tanks, filling and bottling equipment for corrosive liquids, etc. Large prospective users are the photographic, rayon and plastic industries.

Routing Raises Output

(*Continued from Page* 67)

various operators who are involved in its production. The engineering department maintains an adequate supply of blueprints of all parts at all times.

The routing card itself lists all departments—that is, drilling, milling, lathe, grinding, etc.,—to which the part must be routed, also the sequence of its machining operations. Each routing card is given a schedule number (starting at the beginning of each month with No. 1). Thus foremen in various departments know definitely which jobs come first. For example, a job numbered "Feb. 147," obviously is to be executed before that numbered "Feb. 161," while both of these jobs are to be done ahead of one numbered "March 33."

Cards Filed in Order

When a job reaches any of the machining departments, the foreman files the blue routing card on his desk in its proper order. See Fig. 2. As the cards come to the top, he assigns each job to one of his operators. When the cards get near the top in the foreman's file, he sends a trucker to the tool crib for all necessary tools, gages, jigs and fixtures listed on the blueprint. Jigs and fixtures available for the job also are listed on 3 x 5-inch cards filed by job number in the tool crib.

These index cards show exactly where each jig and fixture is located—in other words, in what section of the tool crib and on what shelf. As shown in Fig. 3, the heavier jigs and fixtures are stored on shelves directly on loading platforms. Thus they can be taken off the shelves conveniently, even though 10 feet above the floor. The hand-operated lift truck used then moves them to the job without further loading or unloading operations en route.

While a job is in process, the foreman keeps the blue routing card on a rack attached to his table, as shown in Fig. 2. The cards are held in place behind rows of wire springs, each representing a certain machine in the department. By this means, the foreman can tell at a glance which job is then in progress on any machine in his department. When a job is completed, the foreman makes a record of it on a long form sheet which shows production of his department for the day. When a finished job goes to the stock room, its routing card and blueprint are destroyed.

Occasionally someone is bound to slip up somewhere. Hence there is an established procedure for handling emergency "rush jobs." A special yellow card is used in cases of this kind, this being a signal that the foreman is to put the work on the first machine that is open. To keep a careful check on all rush work, each foreman signs his name, together with the date and time of day, to a record of the job when he receives it.

Every morning a stock boy locates whatever yellow-card jobs are in process in order to double check on whether or not this special work is moving ahead properly, and to get a record of its progress. To avoid any chance of diminishing the effectiveness of these yellow cards, we use them only when *absolutely necessary.*

(*Concluded Next Week*)

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Armor Clad Tips Protect Soldering Irons

■ Armor clad soldering tips for screw tip and plug tip electric soldering irons have been introduced by Stanley Tools, New Britain, Conn. Armor clad tip is of copper with a metal coating that protects high conductivity copper core. Coating protects tip from corrosion and prevents copper from wearing. Tip can be readily tinned without filing and will retain its original shape without amalgamation with solder or oxidation.

Slabber-Edger Setup

(*Concluded from Page* 77)

rectly into gondola cars in the building using overhead crane facilities. Lifting yoke on these buckets employs a unique double pivot. When lifted by crane directly overhead, bucket is supported from a pivot near the center and yoke locks to keep bucket level. With crane off to one side, yoke is lifted to pivot on another point, dumping the bucket. This permits crane operator to lift buckets from well, place on gondola car and dump without requiring assistance.

The two old slab-reheating furnaces were extended 2½ feet on the delivery side to accommodate wider slabs, making total width 29 feet and length 30½ feet. In addition, one new furnace was added and space provided for a fourth. Furnaces are gas fired with burners front and rear.

Hot-mill was changed considerably. What now is No. 3 rougher was the old No. 1 mill with a shear, skew table and holding furnace ahead of it. Old lineup included four 2-high and three 4-high units. One 2-high unit was discarded and the others moved up. Fig. 5 shows new lineup.

Table I gives statistics of hot mill. With the exception of first roughing mill which is used as a scale breaker, each of the other four roughing mills has an individual edger immediately in front of it. First three roughing mill stands are 2-high and last two roughing stands and all six of the finishing stands are 4-high.

Flywheels on roughing mill stands Nos. 1 and 2 are 40,000 and 60,000-horsepower-seconds capacity respectively. Direct-current power for hot mill is supplied at 600 volts from three 4000-kilowatt 3-unit motor-generator sets. In finishing lineup, one 4-high mill was added to give a total of six stands. A new shear also was placed between roughing and finishing mills.

Hot mill delivery tables formerly were of the chain feed type. These have been changed over to roller type. See Fig. 4. New drives were put on Nos. 2 and 3 stands. Screwdowns, previously hand operated, were replaced by motor-operated units with Selsyn indicators and controls for operation from floor level.

Other changes include lengthening runout table to 362 feet 8 inches from last finishing mill to coilers. The two coilers, Fig. 9, were rebuilt as were the various conveyor lines in coil storage, improving handling facilities.

All equipment is in a straight line from reheating furnaces. This includes roughing stands, finishing stands, runout table and coilers.

Dismantling of the old mill was started July 4, 1939, and the mill was back in operation August 5, just a month later. To change over in such a short time, many foundations were placed in advance. However, it is interesting to note that during the last month of operation of the old mill, a new monthly tonnage record was made.

All preparation and changeover work was done with practically no accidents, a remarkable record when one considers the fact that much of the work was done with the mill running.

Coating Protects Metals

■ New coating designated Ampruf Protecto-Lead, for protecting steel surfaces, has been developed by American Waterproofing Corp., 51 Rodney street, Brooklyn, N. Y.

Based on a tough, flexible synthetic rubber vehicle and compounded with pure lead, product features extreme resistance to moisture, corrosive fumes, strong chemicals and deterioration by natural elements. It can be used as a rust inhibitive primer on bare metal and for protection of industrial equipment, machinery, tanks, structural steel, automotive and marine equipment.

Steel Demand Spotty. Trend Upward Slightly

Needs of some consumers heavy, but total buying restricted and output off further. Export markets active

MARKET IN TABLOID ★

Demand

Relatively light but tending upward gradually.

Prices

Generally steady; rail steel bars reduced.

Production

Down 1 point to 62½ per cent.

■ DESPITE scattered gains in domestic markets and continued good activity in export trade, the trend of steel demand still is largely horizontal.

Irregular changes in steelmaking in various districts lately have been unable to reverse the previous course of the national average. Last week saw a 1-point reduction to 62½ per cent, principally the result of a 6-point drop at Pittsburgh. This latter curtailment may be only temporary. Operations a year ago were unchanged at 56½ per cent, preparatory to a spring recession.

Ingot production the past six weeks apparently has declined more rapidly than have finished steel shipments, following the opposite situation in January. Finished steel shipments of the United States Steel Corp. were off 11.9 per cent last month, while the industry's ingot output dropped 22.2 per cent from January.

Steel consumption is spotty, with requirements of a number of users in marked contrast to the generally restricted volume of total steel demand. Best outlets continue the automotive, shipbuilding, machine tool, household equipment and aircraft industries. Building construction has yet to develop the steel buying expected of it by spring, although structural shape and reinforcing bar awards and inquiries were more numerous last week.

What improvement has occurred recently in finished steel orders is attributable more to a reduction in stocks than to an increase in consumption. This situation is particularly noticeable in the number of purchases, gains in which are more pronounced than in total tonnage.

Automobile assemblies continue in high ground, reflecting principally the good volume of retail sales. Last week's output of 105,720 units was a gain of 2160 and the highest in seven weeks. Chrysler furnished most of the upturn, with General Motors' and Ford's operations steady.

Railroad equipment markets are more active, but business has not increased sufficiently to supplant the decline in backlogs the past few months. Outstanding are the placing of 2000 box cars by the Milwaukee road with its own shops and purchases of 14 diesel locomotives by the Delaware, Lackawanna & Western, four diesel locomotives by the Lehigh Valley, eight freight cars by Tennessee Copper Co. and 1000 tons of rails by the Lehigh Valley. Iranian State railways are inquiring for 12 to 24 locomotives, and the Nashville, Chattanooga & St. Louis is in the market for 250 freight cars.

United States maritime commission is taking bids on three cargo-passenger vessels, requiring 15,000 tons of steel, in addition to six large tankers. Italy has placed 22,000 tons of plates, shapes and bars here for four merchant vessels. Large diameter pipe for Rome, N. Y., and Toledo, O., involves 2700 tons of plates.

Electrical refrigerator manufacturers are providing strong support to sheet demand in some districts, as a consequence of recent gains in production.

Tin plate operations have leveled off at 53 per cent, and with the approach of more activity in canning, a reversal in the downward trend in plate output and demand is in order.

Steady prices continue on most steel products. One exception is concrete reinforcing bars. Irregular for a number of weeks, quotations have been reduced officially $3 a ton by some producers. Rail steel merchant bars also have been lowered, a cut of $2 a ton eliminating most of the $3 advance instituted last September, when the price was established on a parity with that of billet bars.

Pig iron shipments generally are steady, following a sharp reduction earlier this year. Export inquiry is brisk, with orders fair. Pig iron production in some districts is being maintained by the use of a larger proportion of hot metal than usual in steelmaking. While this tends to depress scrap values, the latter are holding fairly well in most areas. A small reduction at Pittsburgh, however, has reduced the scrap composite 8 cents to $16.59.

In addition to the 6-point drop to 55 per cent at Pittsburgh, five other districts curtailed steelmaking last week. Reductions were 10 points to 80 at Wheeling, ½ point to 59½ at Chicago, 4½ to 51 at Buffalo, 5 points to 70 in New England and 5 points to 60 at St. Louis. Detroit was up 4 points to 82, with Youngstown 1 point higher at 42. Unchanged were eastern Pennsylvania at 60, Birmingham at 78, Cleveland 73, and Cincinnati at 54½.

COMPOSITE MARKET AVERAGES

	Mar. 16	Mar. 9	Mar. 2	One Month Ago Feb., 1940	Three Months Ago Dec., 1939	One Year Ago Mar., 1939	Five Years Ago Mar., 1935
Iron and Steel	$36.86	$36.83	$36.83	$36.97	$37.18	$36.40	$32.36
Finished Steel	56.10	56.10	56.10	56.10	56.10	56.50	54.00
Steelworks Scrap..	16.59	16.67	16.67	16.98	17.88	14.98	10.75

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Mar. 16, 1940	Feb. 1940	Dec. 1939	Mar. 1939
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.25
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Chicago	2.25	2.30	2.15	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.225	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.10	2.10	2.10	2.15
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.10	2.10	2.10	2.15
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.20
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.00
Wire nails, Pittsburgh	2.55	2.55	2.55	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to ⅝-inch, Pitts.	2.00	2.00	1.98	1.92

Pig Iron

	Mar. 16, 1940	Feb. 1940	Dec. 1939	Mar. 1939
Bessemer, del. Pittsburgh	$24.34	$24.34	$24.34	$22.34
Basic, Valley	22.50	22.50	22.50	20.50
Basic, eastern, del. Philadelphia	24.34	24.34	24.34	22.34
No. 2 foundry, Pittsburgh	24.21	24.21	24.21	22.21
No. 2 foundry, Chicago	23.00	23.00	23.00	21.00
Southern No. 2, Birmingham	19.38	19.38	19.38	17.38
Southern No. 2, del. Cincinnati	22.89	22.89	22.89	20.89
No. 2X, del. Phila. (differ. av.)	25.215	25.215	25.215	23.215
Malleable, Valley	23.00	23.00	23.00	21.00
Malleable, Chicago	23.00	23.00	23.00	21.00
Lake Sup., charcoal, del. Chicago	30.34	30.34	30.34	28.34
Gray forge, del. Pittsburgh	23.17	23.17	23.17	21.17
Ferromanganese, del. Pittsburgh	105.33	105.33	105.33	85.27

Scrap

Heavy melting steel, Pittsburgh	$17.00	$17.75	$18.50	$15.75
Heavy melt. steel, No. 2, E. Pa.	16.00	16.31	17.60	13.375
Heavy melting steel, Chicago	15.75	15.75	16.25	14.25
Rails for rolling, Chicago	18.25	18.25	19.75	17.25
Railroad steel specialties, Chicago	18.50	18.50	18.50	16.25

Coke

Connellsville, furnace, ovens	$4.75	$4.75	$4.75	$3.75
Connellsville, foundry, ovens	5.75	5.75	5.75	5.00
Chicago, by-product fdry., del.	11.25	11.25	11.25	10.50

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.10c
Chicago, Gary	2.10c
Cleveland	2.10c
Detroit, del.	2.20c
Buffalo	2.10c
Sparrows Point, Md.	2.10c
New York, del.	2.34c
Philadelphia, del.	2.27c
Granite City, Ill.	2.20c
Middletown, O.	2.10c
Youngstown, O.	2.10c
Birmingham	2.10c
Pacific Coast points	2.60c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp.	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c
Philadelphia, del.	2.15c
Boston, delivered	2.46c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.10c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c

Structural Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points	2.75c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.05c
Chicago or Gary	2.05c
Detroit, delivered	2.15c
Cleveland	2.05c

Buffalo	2.05c
Birmingham	2.05c
Gulf ports	2.40c
Pacific Coast points	2.65c

Iron

Chicago	2.25c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

*New Billet Bars, Base**

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	1.90-2.00c
Gulf ports	2.25-2.35c
Pacific Coast ports	2.30-2.40c

*Rail Steel Bars, Base**

Pittsburgh, Gary Chicago, Buffalo, Cleveland, Birm.	1.90-2.00c
Gulf ports	2.25-2.35c
Pacific Coast ports	2.30-2.40c

**Subject to a deduction of 25 cents per 100 lbs. in lots of 20 tons or over of one size, in lengths of 30 feet or over, for shipment at one time to one destination.*

Wire Products

Pitts-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard and cement coated wire nails	$2.55
(Per pound)	
Polished fence staples	2.55c
Annealed fence wire	3.05c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	67
Single loop bale ties (base C.L. column)	56
Galv. barbed wire, 80-rod spools, base column	70
Twisted barbless wire, column	70

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.60c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh, keg..$3.85

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.70c

Detroit, delivered 2.80c

Alloy S.A.E.	Diff.	Alloy S.A.E.	Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo.	0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni.	1.10
5100 0.80-1.10 Cr.	0.45
5100 Cr. spring flats	0.15
6100 bars	1.20
6100 spring flats	0.85
Cr. N., Van.	1.50
Carbon Van.	0.85
9200 spring flats	0.15
9200 spring rounds, squares	0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.10c
Detroit, del.	2.20c
Philadelphia, del.	2.42c
New York, del.	2.46c
Pacific Coast points	2.70c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.20c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve., Pitts.
0.26—0.50	2.80c
0.51—0.75	4.30c
0.76—1.00	6.15c
Over 1.00	8.35c

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Chicago	3.05c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, full containers, add 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts separate 72.5 off; with nuts attached add 15%; bulk 83.5 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Plow bolts	68.5 off

Nuts

	U.S.S.	S.A.E.
Semifinished hex. ½-inch and less	67	70
⅝-1-inch	64	65
1⅛-1½-inch	62	62
1⅝ and larger	60	..

Hexagon Cap Screws

Upset, 1-in., smaller	70.0 off

Square Head Set Screws

Upset, 1-in., smaller	75.0 off
Headless set screws	64.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.85c
Pacific coast ports	2.90c

Rivets, Washers

F.o.b. Pitts., Cleve., Chgo., Bham.

Structural	3.40c
⅞-inch and under	65-10 off

Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55
11 and 12	63½	54

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

1 to 3, butt weld	67½
2, lap weld	60
2½ to 3, lap weld	63
3½ to 6, lap weld	65
7 and 8, lap weld	64
10-inch lap weld	63½
12-inch, lap weld	62½

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½ "O.D.	13	$ 9.72	$23.71
1¾ "O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼ "O.D.	13	13.79	21.68
2¼ "O.D.	12	15.16	.....
2½ "O.D.	12	16.58	26.57
2¾ "O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½ "O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1 "O.D.	13	$ 7.82	$ 9.01
1¼ "O.D.	13	9.26	10.67
1½ "O.D.	13	10.23	11.79
1¾ "O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼ "O.D.	13	14.54	16.76
2¼ "O.D.	12	16.01	18.45
2½ "O.D.	12	17.54	20.21
2¾ "O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½ "O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½ "O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$45.00-46.00
4-in., Birmingham	48.00-49.00
4-in., Chicago	56.80-57.80
6-in. & over, Chicago	53.80-54.80
6-in. & over, east fdy.	49.00
Do., 4-in.	52.00

Class A Pipe $3 over Class B

Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅝-inch incl. (per 100 lbs.) $2.00

Do., over ⅝ to ⅞-in. incl. 2.15

Worcester up $0.10; Galveston up $0.25; Pacific Coast up $0.45.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt. 1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$4.35- 4.60
Connellsville, fdry.	5.00- 5.75
Connell. prem. fdry.	5.75- 6.25
New River fdry.	6.25- 6.50
Wise county fdry	5.50- 6.50
Wise county fur.	5.00- 5.25

By-Product Foundry

Newark, N. J., del.	11.38-11.85
Chicago, outside del.	10.50
Chicago, delivered	11.25
Terre Haute, del.	10.75
Milwaukee, ovens	11.25
New England, del.	12.50
St. Louis, del.	11.75
Birmingham, ovens	7.50
Indianapolis, del.	10.75
Cincinnati, del.	10.50
Cleveland, del.	11.05
Buffalo, del.	11.25
Detroit, del.	11.00
Philadelphia, del.	11.15

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	25.00c
Solvent naphtha	27.00c
Industrial xylol	27.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (less than 1000 lbs.)	14.75c
Do. (1000 lbs. or over)	13.75c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	6.75c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birdsboro, Pa.	24.00	24.50	23.50	25.00
Birmingham, Ala.‡	19.38	.....	18.38	24.00
Buffalo	23.00	23.50	22.00	24.00
Chicago	23.00	23.00	22.50	23.50
Cleveland	23.00	23.00	22.50	23.50
Detroit	23.00	23.00	22.50	23.50
Duluth	23.50	23.50	.....	24.00
Erie, Pa.	23.00	23.50	22.50	24.00
Everett, Mass.	24.00	24.50	23.50	25.00
Granite City, Ill.	23.00	23.00	22.50	23.50
Hamilton, O.	23.00	23.00	22.50	.....
Neville Island, Pa.	23.00	23.00	22.50	23.50
Provo, Utah	21.00	.....	.....	.....
Sharpsville, Pa.	23.00	23.00	22.50	23.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	24.00	24.50	23.50	25.00
Toledo, O.	23.00	23.00	22.50	23.50
Youngstown, O.	23.00	23.00	22.50	23.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.31	25.31	24.81	25.81

	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis, northern	23.50	23.50	23.00	....
St. Louis from Birmingham	†23.12	....	22.62	....
St. Paul from Duluth	25.63	25.63	....	26.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $28.50, base; $29.74 delivered Philadelphia.

Gray Forge		Charcoal	
Valley furnace	$22.50	Lake Superior fur.	$27.00
Pitts. dist. fur.	22.50	do., del. Chicago	30.34
		Lyles, Tenn.	26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $28.50; 6.51-7—$29.00; 7-7.50—$29.50; 7.51-8—$30.00; 8-8.50—$30.50; 8.51-9—$31.00; 9-9.50—$31.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00

Ohio

First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Domestic dead - burned grains, net ton f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$50.00
Chem. bonded chrome	50.00
Magnesite brick	72.00
Chem. bonded magnesite	61.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$25.00-$26.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail.	22.00
Do. barge	22.00
No. 2 lump	22.00

Ferroalloy Prices

Ferromanganese, 78-82%, lump and bulk, carlots tide., duty pd. $100.00
Ton lots 110.00
Less ton lots 113.50
Less 200 lb. lots 118.00
Do., carlots del. Pitts. 105.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 32.00
Do., 26-28% 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 82.00
Do., 75 per cent 126.00
Do. ton lots 142.00
Spot, $5 a ton higher.

Silicomanganese, c.l., 2½ per cent carbon, 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $12.50 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 1.90-2.00

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 11.00c
Do., ton lots 11.75c
Do., less-ton lots 12.00c

67-72% low carbon:

	Carloads	Ton lots	Less ton
2% carb.	17.50c	18.25c	18.75c
1% carb.	18.50c	19.25c	19.75c
0.10% carb.	20.50c	21.25c	21.75c
0.20% carb.	19.50c	20.25c	20.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. tl., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, tl., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00

15-18% tl., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, freight allowed, lb. spot carlots, bulk 7.00c
Do., ton lots 7.50c
Do., less-ton lots 7.75c
Do., less 200 lbs. 8.00c
Spot, ¼c higher.

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.50
Do., smaller lots 2.60

Vanadium Pentoxide, contract, lb. contained $1.10
Do. spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 84.00c
Do., spot 89.00c
88% chrome, contract 83.00c
Do., spot 88.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads, bulk, freight allowed, ton $69.50
Ton lots 79.50
Less-ton lots, lb. 3.75c
Less 200 lb. lots, lb. 4.00c
Spot ¼-cent higher.

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, bulk, gross ton $97.50
Do, spot 102.50
34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.98	4.16	5.16	3.85	3.85	5.66	3.81	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	4.50	3.51	4.09	8.59	7.19
Philadelphia	3.85	3.85	4.35	3.55	3.55	5.25	3.55	4.55	4.75	3.51	4.06	8.56	7.16
Baltimore	3.95	4.05	4.45	3.70	3.70	5.25	3.55	....	5.05	....	4.05	....	....
Norfolk, Va.	4.15	4.25	....	3.90	3.90	5.45	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	6.40	4.20	4.40	4.25	3.42	3.75	8.15	6.75
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.75	3.35	3.65	8.15	6.75
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.05	4.72	3.20	3.75	8.15	6.75
Detroit	3.43	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.84	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	4.37	4.67	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.60	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	5.00	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.98	3.54	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.95	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.10	4.10	3.95	3.95	5.71	3.85	....	5.25	....	4.31	....	....
Chattanooga	3.80	4.00	4.00	3.85	3.85	5.68	3.75	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.71	....	4.69	....	....
Birmingham	3.50	3.70	3.70	3.55	3.55	5.88	3.45	....	4.75	....	4.43	....	....
New Orleans	4.00	4.10	4.10	3.80	3.80	5.75	3.85	....	4.80	5.00	4.60	....	....
Houston, Tex.	4.05	6.20	6.20	4.05	4.05	5.75	4.20	....	5.25	....	....	....	....
Seattle	4.00	3.85	5.20	3.40	3.50	5.75	3.70	6.50	4.75	....	5.75	....	....
Portland, Oreg.	4.25	4.50	6.10	4.00	4.00	5.75	3.95	6.50	4.75	....	5.75	....	....
Los Angeles	4.15	4.65	6.45	4.00	4.00	6.40	4.30	6.50	5.25	....	6.60	10.65	9.80
San Francisco	3.50	4.00	6.00	3.35	3.35	5.60	3.40	6.40	5.15	....	6.80	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	4.10	7.31	5.86	5.61	8.56
Baltimore	4.10	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.20	5.75	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.48	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.83	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 400-39,999 (hoops, 0-299) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York, Kansas City and St. Louis; 450-3749 in Boston; 500-1499 in Buffalo; 1000-1999 in Philadelphia, Baltimore; 300-4999 in San Francisco, Portland; any quantity in Twin Cities; 300-1999 in Los Angeles.

Galvanized Sheets: Base, any quantity in New York, 150-1499 pounds in Cleveland, Milwaukee, Pittsburgh, Baltimore, Norfolk; 150-1049 in Los Angeles; 300-4999 in Portland, Seattle, San Francisco; 450-3749 in Boston; 500-1499 in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, St. Louis, Tulsa; 1500 and over in Chattanooga, Philadelphia; any quantity in Twin Cities; 750-1500 in Kansas City; 150 and over in Memphis.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon, except 0-299 in San Francisco, 1000 and over in Portland, Seattle; 1000 pounds and over on alloy, except 0-4999 in San Francisco.

SAE Hot Rolled Alloy Bars: Base, 1000 pounds and over, except 0-4999, San Francisco; 0-1999, Portland, Seattle.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, March 14

Export Prices f.o.b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports	£ s d	Continental Channel or North Sea ports, gross tons: Quoted in dollars at current value	**Quoted in gold pounds sterling	£ s d
Foundry, 2.50-3.00 Si.	$22.44	6 0 0	$33.23		3 18 0
Basic bessemer	.....	.....	.....		.....
Hematite, Phos. .03-.05	23.38	6 5 0	.....		.....
Billets	.....	.....	$31.95		3 15 0
Wire rods, No. 5 gage	.....	.....	61.77		7 5 0
Standard rails	$39.27	10 10 0	$48.99		5 15 0
Merchant bars	2.25c	13 9 0	2.70c		7 2 0
Structural shapes	2.02c	12 2 6	2.85c		7 10 0
Plates, †¼ in. or 5 mm.	2.15c	12 17 6	3.19c		8 8 0
Sheets, black, 24 gage or 0.5 mm	2.84c	17 0 0	3.02c		7 19 0
Sheets, gal., 24 ga., corr.	3.26c	19 10 0	4.47c		11 15 0
Bands and strips	.....	.....	2.71c		7 2 6
Plain wire, base	.....	.....	3.23c		8 10 0
Galvanized wire, base	.....	.....	3.90c		10 5 0
Wire nails, base	.....	.....	3.71c		9 15 0
Tin plate, box 108 lbs.	$ 6.08	1 12 6	.....		.....

British ferromanganese $100.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reichsmk §§Mar
Fdy. pig iron, Si. 2.5.	$20.75	5 11 0(a)	$16.78	788	$29.75	875	$25.33 63
Basic bess. pig iron	19.54	5 4 6(a)	.....	...	27.20	800	27.94 (b) 69.50
Furnace coke	5.92	1 11 8	4.79	225	10.54	310	7.64 19
Billets	35.06	9 7 6	24.77	1,163	43.35	1,275	38.79 96.50
Standard rails	1.86c	11 3 0	1.59c	1,588	2.06c	1,375	2.38c 132
Merchant bars	2.34c	14 0 0††	1.45c	1,454	2.06c	1,375	1.98c 110
Structural shapes	2.07c	12 8 0††	1.41c	1,414	2.06c	1,375	1.93c 107
Plates, †¼-in. or 5 mm.	2.09c	12 10 6††	1.85c	1,848	2.42c	1,610	2.29c 127
Sheets, black	2.92c	17 10 0§	2.19c	2,193‡	2.85c	1,900‡	2.59c 144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.34c	20 0 0	2.85c	2,850	4.80c	3,200	6.66c 370
Plain wire	3.26c	19 10 0	2.34c	2,340	3.00c	2,000	3.11c 173
Bands and strips	2.46c	14 15 0††	1.63c	1,632	2.18c	1,450	2.29c 127

†British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price.

British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel.

(a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed.

††Rebate of 15s on certain conditions. N—Nominal.

**Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1.	15.00
Bos. dock No. 1 exp.	15.00
New Eng. del. No. 1	14.00
Buffalo, No. 1	16.50-17.00
Buffalo, No. 2	14.50-15.00
Chicago, No. 1	15.50-16.00
Chicago, auto. no alloy	14.50-15.00
Chicago, No. 2 auto	12.50-13.00
Cincinnati dealers	12.50-13.00
Cleveland, No. 1	16.00-16.50
Cleveland, No. 2	15.00-15.50
Detroit, No. 1	†12.50-13.00
Detroit, No. 2	†11.50-12.00
Eastern Pa., No. 1	17.00-17.50
Eastern Pa., No. 2	16.00
Federal, Ill.	13.50-14.00
Granite City, R. R.	14.50-15.00
Granite City, No. 2	13.50-14.00
Los Ang., No. 1, net	12.50-13.00
Los Ang., No. 2, net	11.50-12.00
L. A., No. 1 f.a.s.	16.00-17.00
L. A., No. 2 f.a.s.	15.00-16.00
N. Y. dock No. 1 exp.	14.00
Pitts., No. 1 (R. R.)	18.00-18.50
Pittsburgh, No. 1	16.75-17.25
Pittsburgh, No. 2	15.75-16.25
St. Louis, R. R.	†14.25-14.50
St. Louis, No. 2	†13.50-14.00
San Fran., No. 1, net	12.50-13.00
San Fran., No. 2, net	11.50-12.00
Seattle, No. 1	14.50-15.50
Toronto, dirs., No. 1	11.00
Valleys, No. 1	16.50-17.00

COMPRESSED SHEETS

Buffalo, new	15.00-15.50
Chicago, factory	15.00-15.50
Chicago, dealers	13.50-14.00
Cincinnati, dealers	12.00-12.50
Cleveland	15.50-16.00
Detroit	†13.00-13.50
E. Pa., new mat.	17.00-17.50
E. Pa., old mat.	14.00-14.50
Los Angeles, net	10.50-11.00
Pittsburgh	16.75-17.25
St. Louis	†11.00-11.50
San Francisco, net	10.50-11.00
Valleys	16.00-16.50

BUNDLED SHEETS

Buffalo, No. 1	14.50-15.00
Buffalo, No. 2	13.00-13.50
Cleveland	11.50-12.00
Pittsburgh	15.75-16.25
St. Louis	†9.00- 9.50
Toronto, dealers	9.75

SHEET CLIPPINGS, LOOSE

Chicago	10.50-11.00
Cincinnati, dealers	8.00- 8.50
Detroit	†9.00- 9.50
St. Louis	†8.50- 9.00
Toronto, dealers	9.00

BUSHELING

Birmingham, No. 1.	13.00
Buffalo, No. 1	14.50-15.00
Chicago, No. 1	14.50-15.00
Cincin., No. 1, deal.	9.00- 9.50
Cincin., No. 2 deal.	3.00- 3.25
Cleveland, No. 2	9.50-10.00
Detroit, No. 1, new	†12.00-12.50
Valleys, new, No. 1	15.50-16.00
Toronto, dealers	5.50- 6.00

MACHINE TURNINGS (Long)

Birmingham	5.00
Buffalo	10.00-10.50
Chicago	9.25- 9.75
Cincinnati, dealers	5.00- 5.50
Cleveland, no alloy	8.50- 9.00
Detroit	†7.00- 7.50
Eastern Pa.	10.00-10.50
Los Angeles	4.00- 5.00
New York	†6.50- 7.00
Pittsburgh	10.50-11.00
St. Louis	†6.50- 7.00
San Francisco	5.00
Toronto, dealers	6.75- 7.00
Valleys	10.50-11.00

SHOVELING TURNINGS

Buffalo	12.50-13.00
Cleveland	9.50-10.00
Chicago	9.50-10.00
Chicago, spcl, anal.	12.50-13.00
Detroit	†8.50- 9.00
Pitts., alloy-free	12.00-12.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston district	†4.00
Buffalo	10.00-10.50
Cincinnati, dealers	3.75- 4.25
Cleveland	9.50-10.00
Eastern Pa.	9.50
Detroit	†7.25- 7.75
New York	†5.75- 6.00
Pittsburgh	9.00- 9.50
Toronto, dealers	6.00

AXLE TURNINGS

Buffalo	16.50-17.00
Boston district	†9.50-10.00
Chicago, elec. fur.	16.50-17.00
East. Pa. elec. fur.	16.50-17.00
St. Louis	†10.00-10.50
Toronto	6.00- 6.50

CAST IRON BORINGS

Birmingham	7.50
Boston dist. chem.	†8.00- 8.25
Buffalo	10.00-10.50
Chicago	9.25- 9.75
Cincinnati, dealers	3.75- 4.25
Cleveland	9.50-10.00
Detroit	†7.25- 7.75
E. Pa., chemical	14.50-15.00
New York	†7.00
St. Louis	†5.00- 5.50
Toronto, dealers	6.25- 6.50

RAILROAD SPECIALTIES

Chicago	18.25-18.75

ANGLE BARS—STEEL

Chicago	18.00-18.50
St. Louis	†15.50-16.00

SPRINGS

Buffalo	19.50-20.00
Chicago, coil	18.50-19.00
Chicago, leaf	17.50-18.00
Eastern Pa.	21.00-21.50
Pittsburgh	20.50-21.00
St. Louis	†16.50-17.00

STEEL RAILS, SHORT

Birmingham	16.50
Buffalo	21.50-22.00
Chicago (3 ft.)	18.50-19.00
Chicago (2 ft.)	19.00-19.50
Cincinnati, dealers	19.00-19.50
Detroit	†19.50-20.00
Pitts., 3 ft. and less	20.50-21.00
St. Louis, 2 ft.& less	†18.00-18.50

STEEL RAILS, SCRAP

Birmingham	16.00
Boston district	†14.00-14.50
Buffalo	17.00-17.50
Chicago	16.00-16.50
Cleveland	18.50-19.00
Pittsburgh	18.50-19.00
St. Louis	†15.25-15.75
Seattle	18.00-18.50

PIPE AND FLUES

Chicago, net	10.00-10.50
Cincinnati, dealers	9.75-10.25

RAILROAD GRATE BARS

Buffalo	11.50-12.00
Chicago, net	10.00-10.50
Cincinnati, dealers	8.50- 9.00
Eastern Pa.	15.00-15.50
New York	†10.50-11.00
St. Louis	†10.00-10.50

RAILROAD WROUGHT

Birmingham	14.00
Boston district	†9.50-10.00
Eastern Pa., No. 1	18.00-18.50
St. Louis, No. 1	†10.25-10.75
St. Louis, No. 2	†13.25-13.75

FORGE FLASHINGS

Boston district	†10.00-10.25
Buffalo	14.50-15.00
Cleveland	15.00-15.50
Detroit	†11.50-12.00
Pittsburgh	15.50-16.00

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	18.00-18.50

LOW PHOSPHORUS

Cleveland, crops	21.50-22.00
Eastern Pa. crops	21.00-21.50
Pitts., billet, bloom, slab crops	21.50-22.00

LOW PHOS. PUNCHINGS

Buffalo	19.50-20.00
Chicago	17.50-18.00
Cleveland	17.50-18.00
Eastern Pa.	21.50-22.00
Pittsburgh	19.50-20.00
Seattle	15.00
Detroit	†13.25-13.75

RAILS FOR ROLLING

5 feet and over

Birmingham	16.50
Boston	†15.75-16.00
Chicago	18.00-18.50
New York	15.50-16.00
Eastern Pa.	20.00-21.00
St. Louis	†17.50-18.00

STEEL CAR AXLES

Birmingham	18.00
Boston district	†16.00-16.50
Chicago, net	20.50-21.00
Eastern Pa.	22.00
St. Louis	†18.00-18.50

LOCOMOTIVE TIRES

Chicago (cut)	18.00-18.50
St. Louis, No. 1	†15.75-16.25

SHAFTING

Boston district	†17.00-17.25
New York	†18.00-18.50
Eastern Pa.	23.00-23.50
St. Louis, 1¼-3¾"	†16.50-17.00

CAR WHEELS

Birmingham, iron	13.00
Boston dist., iron	†13.00-13.25
Buffalo, steel	21.00-21.50
Chicago, iron	17.00-17.50
Chicago, rolled steel	17.50-18.00
Cincin., iron, deal.	16.50-17.00
Eastern Pa., iron	20.00-20.50
Eastern Pa., steel	21.00-21.50
Pittsburgh, iron	18.50-19.00
Pittsburgh, steel	20.50-21.00
St. Louis, iron	†15.50-16.00
St. Louis, steel	†16.25-16.75

NO. 1 CAST SCRAP

Birmingham	16.00
Boston, No. 1 mach.	†14.50
N. Eng. del. No. 2	14.00-14.50
N. Eng. del. textile	17.75-18.25
Buffalo, cupola	16.50-17.00
Buffalo, mach.	17.50-18.00
Chicago, agri. net	12.50-13.00
Chicago, auto net	14.50-15.00
Chicago, railroad net	14.00-14.50
Chicago, mach. net	14.50-15.00
Cincin., mach. deal.	16.00-16.50
Cleveland, mach.	20.00-21.00
Detroit, cupola, net	†14.50-15.00
Eastern Pa., cupola	19.50-20.00
E. Pa., No. 2 yard	16.00
E. Pa., yard fdry.	16.50-17.00
Los Angeles	16.50-17.00
Pittsburgh, cupola	17.50-18.00
San Francisco	14.50-15.00
Seattle	16.00-16.50
St. Louis, breakable	†13.75-14.25
St. Louis, agri. mach.	†15.50-16.00
St. L., No. 1 mach.	†16.50-17.00
Toronto, No. 1, mach., net dealers	15.50

HEAVY CAST

Boston dist. break.	†12.75-13.25
New England, del.	15.00-15.50
Buffalo, break	14.50-15.00
Cleveland, break, net	15.25-15.75
Detroit, auto net	†15.50-16.00
Detroit, break	†11.00-11.50
Eastern Pa.	18.50
Los Ang., auto, net.	13.00-14.00
New York break	†13.50-14.00
Pittsburgh, break	15.00-15.50

STOVE PLATE

Birmingham	10.00
Boston district	†10.50-11.00
Buffalo	13.50-14.00
Chicago, net	8.50- 9.00
Cincinnati, dealers	8.25- 8.75
Detroit, net	†9.00- 9.50
Eastern Pa.	15.00-15.50
New York fdry.	10.00
St. Louis	†11.25-11.75
Toronto dealers, net	11.50

MALLEABLE

New England, del.	21.00
Buffalo	16.50-17.00
Chicago, R. R.	18.50-19.00
Cincin., agri., deal.	13.25-13.75
Cleveland, rail	20.50-21.00
Eastern Pa., R. R.	21.50-22.00
Los Angeles	12.50
Pittsburgh, rail	21.00-21.50
St. Louis, R.R.	†16.00-16.50

Ores

Lake Superior Iron Ore

Gross ton, 51½ %

Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	9.00-10.00

Foreign Ore

(Prices nominal)

Cents per unit c.i.f. Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mn.	14.00-15.00
Swedish low phos.	14.00
North African low phos.	14.00
Spanish, No. African basic, 50 to 60%	14.00
Chinese wolframite, short ton unit, duty paid	$23.00-23.50
Scheelite, imp.	$23.50-24.50
Chrome ore, Indian, 48% gross ton, cif.	$26.00-28.00

Manganese Ore

Including war risk but not duty, cents per unit cargo lots.

Caucasian, 50-52%	48.00-50.00
So. African, 50-52%	48.00-50.00
Indian, 49-50%	nom
Brazilian, 48-52%	46.00-48.00
Cuban, 50-51%, duty free	61.20

Molybdenum

Sulphide conc., per lb., Mo. cont., mines	$0.75

Sheets, Strip

Sheet & Strip Prices, Pages 86, 87

Pittsburgh—Sheet releases and production hold at recent levels, although bookings have been good recently. Mill operations apparently have leveled off at slightly less than 60 per cent. Some sellers look for heavier automotive releases to increase operations before the end of March. The farm market has yet to open up in any large volume. Prices of most flat-rolled products are steady.

Cleveland—Sheets are slightly more active. Buying usually is in small lots, but there are occasional exceptions. The intensive merchandising campaign of electrical refrigerator manufacturers is reflected in heavy production and sizable sheet requirements, while stove plants also are relatively busy. Sustained shipments to the automotive industry are indicated for a number of weeks.

Chicago—Steady order volume has supplanted the previous decline. Automotive demand continues active, supplemented by roofing, home refrigerator, and tractor and small farm machinery orders.

Boston—Although buying of narrow cold strip is slightly heavier, volume is barely above 50 per cent of capacity. Shipments hold relatively high and, as a result, most mills will have practically cleaned up backlogs by the end of the month. Despite a disappointing volume of tonnage destined for the automotive industry, new business is slightly ahead of last month. In spots consumption is heavier, but users continue to live off inventories largely. There is also a disposition to hold larger inventories than last September when the heavy movement started.

New York—Sheet specifications have improved slightly, principally the result of heavier needs of household appliance manufacturers. Building requirements are more promising with spring close at hand. Inventories vary with different buyers. Warehouses still are fairly well supplied, but some consumers are absorbing material as fast as received. This is especially true among electrical equipment makers. Hot-rolled sheet deliveries average around three weeks with cold-rolled three to four weeks.

Philadelphia—Automotive releases have increased somewhat, the result of better activity here on Ford, Chevrolet, Studebaker and Packard body work and Chevrolet frames. No large commitments are reported from miscellaneous users, but requirements of stove makers and roofing products manufacturers have expanded slightly. Prices are holding.

Cincinnati—Galvanized sheet demand continues contra-seasonally low as weather delays construction. Steelmaking is maintained by backlogs as new business is under shipments. Automotive demand is rising but still below expectation.

Birmingham, Ala.—Demand is not up to expectations, due largely to continued inclement weather which has materially delayed spring buying. Production is estimated near 85 per cent. Strip output is on a modest scale only.

Buffalo—Sheet and strip inquiries are slightly heavier, but new business is insufficient to increase production. Buyers are covering only early needs but are curtailing inventories.

Toronto, Ont.—Demand continues heavy, due partly to placing of large war contracts. Bookings of Canadian mills are almost solid for second quarter with some contracts into third quarter. In addition, large orders for quick delivery are going

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BLANK GEAR

137" O.D.—17" FACE—WEIGHT 19,100 LBS.

• Strong is considered by the purchasers of Steel castings as specialists in the manufacture of gears. We recommend Strong No. 18 which embodies high ductility in conjunction with high tensile strength. QUALITY and SERVICE—quality is assured when Strong Steel Foundry Castings are used. Keeping delivery promises is another STRONG point. You have real cooperation on your specifications and your castings are thoroughly cleaned and annealed when ordered from STRONG.

STRONG

TENSILE STRENGTH • ELONGATION

STRONG STEEL FOUNDRY COMPANY, BUFFALO, N Y.

to the United States from the automotive industry, electrical equipment makers and others.

Plates

Plate Prices, Page 86

Cleveland—Business is mostly in small lots. Repair work on lake vessels is taking a moderate tonnage, but little additional buying of freight car material is in early prospect. Plate deliveries average two weeks or more.

Chicago—Demands of heavy machinery builders are improving orders, with tank work holding steady. Railroad car requirements are tapering but support is expected soon from a number of cars now on inquiry.

Boston—Demand for plates continues slack, with less-than-car lot volume predominating. Some fill-in orders have been placed by warehouses, but total tonnage is light. Boiler and structural shops are placing little tonnage and railroad releases are spotty. Tank work in volume is lacking. On the limited volume being placed prompt delivery is asked. Shipyard releases are steady but not widely distributed.

New York—About 15,000 tons of steel for hull and superstructure will be required for three combination cargo-passenger vessels for Mississippi Shipping Co., New Orleans. United States maritime commission will open bids on these boats April 9. As previously reported, bids to the commission close March 19 on six tankers reqiring 33,000 tons.

Robins Dry Dock Co., Brooklyn, has booked a $2,000,000 navy contract for the conversion of the U. S. S. WHARTON into a transport.

Philadelphia—Italy has placed 22,000 tons of plates, shapes and bars, including 16,000 tons of plates, for four merchant vessels. It is understood the order went to one mill. Additional plate inquiries are reported from Scandinavia, South America and Canada. The Chester, Pa., interest may be in a position shortly to place approximately 40,000 tons of steel, including 32,000 tons of plates, for one tanker for Atlantic Refining Co., three tankers for Standard Oil Co. and six for the maritime commission. Miscellaneous domestic business is disappointing, although light tank work shows some seasonal expansion. Domestic prices are steady but export quotations are weaker.

Birmingham, Ala.—Production is holding fairly well to schedules established several weeks ago, but backlogs rapidly are diminishing. Business is not in sufficient volume to hold production at currently estimated rate of 80 per cent.

Seattle—Inquiry has quickened and several sizable projects are developing. Shops report a fair aggregate in small tonnages, including mining pipe, boilers and industrial miscellany. Bellingham, Wash., is considering a water line job involving 1500 tons, bids expected in about 60 days. Cle Elum, Wash., has called bids March 27, to Parker & Hill, Seattle, engineers, for a $115,000 water system project, involving 32,600 feet of 16-inch steel pipe, about 500 tons.

San Francisco—Plate inquiries and bookings consisted of lots of less than 100 tons. To date this year 15,292 tons have been placed, compared with 12,693 tons for the same period a year ago.

The Blaw-Knox Bucket illustrated is a two-line, hook-on type, 3 cubic yards capacity. It weighs 19,400 lbs. and is equipped with Chrome Nickel Moly lips cast in one piece. Its operating head room reeved with two parts of line is 16'7", with three parts of line 23'5". This and other modern Blaw-Knox buckets have progressed with steel mill practice and equipment.

BLAW-KNOX
BLAW-KNOX DIVISION
• OF BLAW-KNOX CO. •
Farmers Bank Bldg. · Pittsburgh, Pa.
Digging and Rehandling
BUCKETS

Plate Contracts Placed

200 tons, 10-inch water pipe, 10-gage, for Leavenworth, Wash., to Washington Corrugated Culvert Co., Seattle.

Plate Contracts Pending

2100 tons, welded steel pipe, 8-foot 6-inch to 10-foot 3-inch, replacement work on Los Angeles aqueduct, Los Angeles; bids March 20.

1500 tons, proposed water system improvement, Bellingham, Wash.; bids expected in about 60 days.

500 tons, 16-inch 3/16-inch water pipe for Cle Elum, Wash.; bids to Parker & Hill, Seattle, engineers, March 27.

Bars

Bar Prices, Page 86

Cleveland — Changes in bar demand are small, but the trend is upward, and March business gives indications of bettering that of either the preceding two months. Reduction in mill backlogs permits early delivery on new business, while curtailment in consumer inventories largely is responsible for recent gains in buying. Rail steel merchant bars and bands have been reduced $2 a ton to 2.05c, Cleveland.

Chicago—Rail steel merchant bars have been reduced $2 a ton to 2.05c, base. This brings the spread between billet and rail steel material down to $2 a ton, compared with the $3 differential prevailing prior to last September, when the latter was advanced to a parity with the current 2.15c base on billet bars. Rail steel bands also are quoted 2.05c, with axle steel bars and bands now 2.10c. Demand for carbon and alloy steel bars is tending upward but still is light despite active requirements of farm equipment builders.

Boston—Carbon bar buying has improved in spots, and demand for alloys is well maintained. Machine tool and aircraft building are consuming substantial tonnage of the latter. Further improvement in deliveries is noted. Warehouses are placing a few more orders to round out stocks. Miscellaneous buying, notably in small sizes, is slightly more active.

New York—Bar specifications appear to be scraping bottom. Releases from railroads and equipment builders have declined further, but this is offset by gains elsewhere. Machine tool specifications are well sustained, while shipyard releases are heavier and government shop tonnage is tending upward. Requirements of bolt and nut makers have lagged badly, but better business is in prospect for April.

Philadelphia — Carbon bars are moving more slowly, with miscellaneous consumers showing little interest and warehouses making few replacements. Alloy bars are relatively more active, with some producers still offering a minimum of 12 weeks for delivery of certain items.

Birmingham, Ala.—Production is steady, but largely on account of backlogs. Orders have shown no appreciable slackening during past week or two, but are not more than 50 per cent of current output.

Buffalo—Buying still is restricted, with production holding at the slower pace inaugurated early this month. Additional buyers are in the market but only small tonnages are being placed.

Pipe

Pipe Prices, Page 87

Chicago—Market is fairly quiet, although a few WPA tonnages are on inquiry. Outlook for spring remains good, but buying is still believed hampered somewhat by poor construction weather. St. Paul, Minn., bureau of water will take bids March 26 on 464 tons of pipe. Two WPA jobs in Ohio total 229 tons. James B. Clow & Sons are

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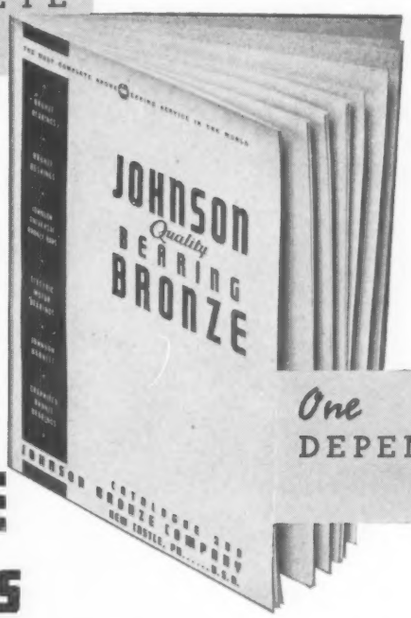

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BRONZE BEARINGS

BUSHINGS

BAR BRONZE

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Sleeve BEARING HEADQUARTERS

550 S. MILL STREET • NEW CASTLE, PA.

reported awarded 512 tons of pipe involved in waterworks improvement at Flint, Mich.

Boston—Slight improvement in merchant steel pipe buying is noted in some sections, although individual shipments are small. Cast pipe inquiry tends upward and some annual blanket contracts are being placed.

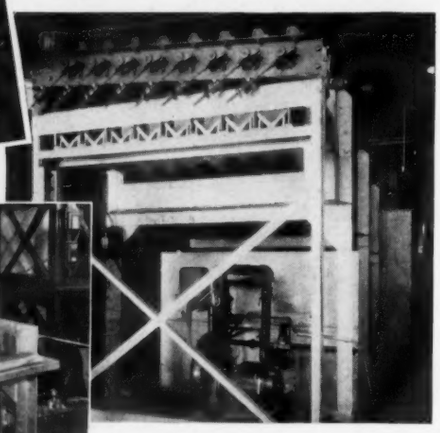
Seattle—Largest project pending involves 300 tons of 4 to 8-inch cast iron for an improvement at Cle Elum, Wash., bids March 27, also hydrants and other items. Seattle opened figures March 14 for the Pullman avenue extension, tonnage unstated.

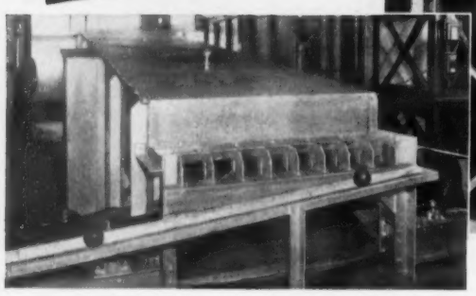
Birmingham, Ala.—Production is maintained at three and four days a week, largely on small business and in small lots, but inquiries are reasonably active.

San Francisco—Carload business continues to hold up well and many small lots have been placed. Awards aggregated 765 tons, bringing the total to date to 6383 tons, compared with 6253 tons for the corresponding period in 1939.

Another SPECIAL DESIGN by "SALEM"

This view shows charging end of furnace—portion of automatic feeding mechanism in evidence at top.





View at left shows discharge end of furnace—also automatically operated.

12 TONS of 5" BALLS per 8 HOURS
with SALEM fully automatic DRAWING FURNACE

This capacity is based on heating grinding balls from cold to 600° Fahr. Hearth capacity 460 5" balls; consequent heating time 2¾ hours. This furnace has an equivalent capacity when handling 3" balls of 7 tons per 8 hours. This furnace is of the recirculating type and is fired with fuel oil.

Elevator raises balls to top of charging end where they roll, one by one, by gravity through automatic closing, flap type doors. The last door closes a limit switch which repeats the cycle. Balls feed by gravity through the furnace. At discharge end a chain driven mechanism automatically discharges one ball at a time onto a gravity conveyor just outside the furnace.

Completely automatic, the simplicity of design and operation of this furnace is typical of "SALEM" Engineering which has solved many a difficult and unusual industrial heating problem.

The "SALEM" Engineering staff loves special or unusual problems, to which are applied sound engineering and building experience plus practical imagination to see new solutions. A qualified representative will be glad to consult with you on your problems.

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Steel Pipe Placed

1880 tons, 30-inch steel pipe, city of Rome, N. Y., to Lock Joint Pipe Co., Ampere, N. J.

800 tons, 42-inch pipe for city of Toledo, O., to Bethlehem Steel Co., Bethlehem, Pa.

683 tons, 48-inch water main, soldiers' home, Washington, to Alco Products Inc., New York.

Cast Pipe Pending

300 tons, 4 to 8-inch for Cle Elum, Wash.; bids March 27; Parker & Hill, Seattle, engineers.

Unstated, Pullman avenue improvement, Seattle; bids March 14.

Rails, Cars

Track Material Prices, Page 87

With the closing of bids last week on 1000 all-steel box cars for the New York Central, little new car business remains to be figured. Repair work includes rebuilding of 96 World's Fair shuttle cars by Long Island railroad at its Jamaica, Long Island, shops.

Award of 25 steam locomotives, on which the New York Central opened bids early in the month, is expected shortly. Recent awards involved four 600-horsepower diesel-electric locomotives for the Lehigh Valley, three going to the Electro-Motive Corp., La Grange, Ill., and one to the American Locomotive Co., New York, and 14 for the Delaware, Lackawanna & Western, 11 going to Electro-Motive and three to American Locomotive Co.

Locomotives Placed

Delaware, Lackawanna & Western, 11 diesel-electric locomotives to Electro-Motive Corp., La Grange, Ill., and three to American Locomotive Co., New York.

Lehigh Valley, four 600-horsepower diesel-electric locomotives, three to the Electro-Motive Corp., La Grange, Ill., and one to the American Locomotive Co., New York.

Locomotives Pending

Iranian State Railways, Teheran, Iran (Persia), 12 to 24 locomotives of the 2-8-2 or 2-10-2 type; bids asked.

Car Orders Placed

Chicago, Milwaukee, St. Paul & Pacific, 2000 all-steel box cars, to own shops in Milwaukee.

Tennessee Copper Co., eight 50-ton air-dump cars, to Pressed Steel Car Co., Pittsburgh.

Rail Orders Placed

Lehigh Valley, 1000 tons, to Bethlehem Steel Co., Bethlehem, Pa.

Car Orders Pending

Nashville, Chattanooga & St. Louis, 200

gondolas and 50 hoppers; bids March 18.

Philadelphia Transportation Corp., 50 to 130 electric street cars; bids March 29; probably will buy 100.

Buses Booked

American Car & Foundry Motors Co., New York; Twenty six for Boston Elevated Railway Co.; ten for Blue Ridge Transportation Co., Hagerstown, Md.

Buses Pending

St. Louis Public Service Co., St. Louis, 100 buses, using either gas-electric, diesel-electric or diesel-hydraulic types of power, bids asked.

Wire

Wire Prices, Page 87

Cleveland—Tendency in business is upward, although improvement lately has been small. Shrinkage in consumer backlogs is aiding demand for manufacturers' wire. Merchant products still are handicapped by the weather but have a fairly good outlook for spring. Export markets continue active.

Chicago—Sales are holding. Volume has been irregular, but as a whole has leveled out and no further downtrend is anticipated. Rather, coming weeks are expected to bring a continued upward tendency. Automotive interests reportedly are awaiting heavier buying by motor plants themselves before making forward commitments. Agricultural equipment requirements are holding up surprisingly well..

New York—Buying has improved and some sellers report last week the best this year. More business is coming from automotive users and demand is also stimulated by minor changes in extras effective April 1. Most new business is specified for early delivery.

Birmingham, Ala.—Although not in expected volume, demand for wire products is steady. Most tonnage is in small lots, however.

Tin Plate

Tin Plate Prices, Page 86

Tin plate releases from can companies are slightly more active, and sellers believe an upward trend in demand and production is in early prospect. Production was unchanged last week at 53 per cent. Buying was excessive last fall, especially among smaller consumers, but with the major canning season now a little more than two months away, some increase in container inventories is looked for shortly. General line can releases are steady and account for a good part of present business. Export markets continue active.

Shapes

Structural Shape Prices, Page 86

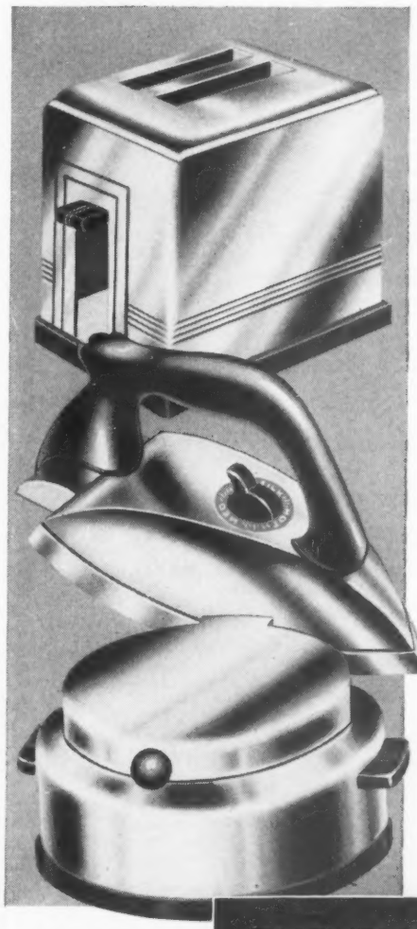
Pittsburgh—Inquiries and awards are gaining, with new public works tonnages adding to steady consumption by private construction. Prices are firm despite small fluctuations on major projects and warehouse lots.

Cleveland—Only a few jobs involving more than 100 tons are pending here, and structural fabricators are operating with scant backlogs. Active inquiries include several hundred tons for Industrial Rayon Corp., Painesville, O., and 800 tons of piling for straightening the Cuyahoga river here.

Chicago — Orders are improved, according to larger producers, although local business is unchanged. Inquiries are few and construction here is quiet, partly due to adverse weather.

Boston—Bids are in on a 3500-ton building, South Boston, for the bureau of yards and docks, Washington, the largest pending struc-

Thomas Strip Promotes Product Improvement and Cost-Saving Production for Household Appliances



Appliance manufacturers demand cold rolled strip steel in the brightest, smoothest, mirror-like finish they can find. That is why many of them are large users of Thomastrip. Buffing and polishing operations prior to plating are practically eliminated. The steel is uniform in gauge, width and temper, and production moves rapidly into beautifully finished products.

Thomastrip is also supplied in a wide variety of electro coated finishes. Samples will be mailed on request.

STEELS THAT STIMULATE PROGRESS

BRIGHT FINISH UNCOATED, AND ELECTRO COATED WITH NICKEL, ZINC, COPPER, BRASS, BRONZE, TIN

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SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL
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tural steel project in this district. Miscellaneous inquiry is up slightly, but pending tonnage and volume under contract thus far this year is well below 1939. A housing project, New Bedford, Mass., takes a moderate tonnage. Massachusetts closes April 2 on additional small bridges.

New York—Enhanced outlook for structural steel is centered largely on a few large engineering projects, including grade crossings in Brooklyn and Long Island, taking close to 60,000 tons. Bids on the first sections are expected shortly. Battery-Brooklyn tunnel has been approved and will take a large tonnage, including close to 90,000 tons of shapes and segments, steel or cast iron. John Kennedy & Co., New York, are low on the Fort Hamilton high school, Brooklyn, 2500 tons.

Buffalo—A few small private industrial projects have appeared. Major interest, however, is still centered on government projects, which comprise most pending tonnage.

Philadelphia — Hughes-Foulkrod Co., Philadelphia, is low on the base bid for the Boston navy yard job opening March 12, involving 3250 tons of shapes. Several private projects are pending, including a new office building here for Westinghouse taking 500 tons. Prices still are weak.

Seattle—Immediate prospects are not encouraging as no important projects have developed. Plans for the Kettle river state bridge, Washington, 1000 tons or more, will probably not be out for 60 days. Shops have fairly large backlogs. Lehigh Structural Steel Co. is reported to have been awarded 529 tons substation steel by the Bonneville project and 580 tons for the same agency is reported placed with an unnamed interest.

San Francisco—Awards totaled 2436 tons, bringing the aggregate for the year to 48,111 tons, against 32,208 tons a year ago. Bethlehem Steel Co. was awarded 1081 tons of sheet steel piling for improvement of the Los Angeles river channel between Downey road and Atlantic boulevard, Los Angeles, and 310 tons of bearing piles for work between Mariposa and Fletcher streets.

Toronto, Ont.—Speeding up of building activities in this country is responsible for improved demand for structural steel, with prospective orders running about 10,000 tons. Orders pending include 500 tons for office building at Ottawa for war supply board; 500 tons for bridge at Ile Bigras, Que., for provincial department of public works, Quebec. Dominion Bridge Co. Ltd., Toronto, received contract for 300 tons steel for warehouse for Canada Steamship Lines, Toronto.

Birmingham, Ala.—Demand has been erratic in this section for several weeks, and now is not especially active. Some tonnage has been carried over from last year.

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By a simple immersion process CUPRODINE produces a fine bright copper coating that is denser and more adherent than usual—on wire and strip in the mills—for masking surfaces prior to carburizing—as a foundation for rubber.

CUPRODINE is simply added to the sulphuric acid solution. The coating time is measured in seconds, and the process is also economical of labor and materials.

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CHEMICALS ACP PROCESSES

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Detroit, Michigan — Walkerville, Ont.

Shape Contracts Placed

1682 tons, Antler bridge over Sacramento river, Antler, Calif., to American Bridge Co., Pittsburgh.

1600 tons, Dutch Kills bridge, contract

Shape Awards Compared

	Tons
Week ended March 16	14,252
Week ended March 9	13,210
Week ended March 2	43,070
This week, 1939	22,227
Weekly average, year, 1940	19,657
Weekly average, 1939	22,411
Weekly average, February	31,399
Total to date, 1939	256,913
Total to date, 1940	216,227

Includes awards of 100 tons or more.

3, New York, for city, to Harris Structural Steel Co., New York.

1375 tons, buildings for Aluminum Co. of America, Vancouver, Wash., to Bethlehem Steel Co., Bethlehem, Pa.; includes 910 tons for pot rooms and passageways, 165 tons rectifier station, 160 tons service station, 140 tons transformer shop.

1081 tons, sheet piling, improvement Los Angeles river channel between Downey road and Atlantic boulevard, Los Angeles, to Bethlehem Steel Co., Los Angeles.

970 tons, apartment buildings at 331 West Fifty-Seventh street and 334 West Fifty-Eighth street, New York, to Dreier Structural Steel Co., New York.

750 tons, hangar repairs, North Beach, N. Y., treasury department, to Bethlehem Steel Co., Bethlehem, Pa.

580 tons for 131 transmission towers, Bonneville project, Portland, Oreg., to unstated interest.

529 tons, steel framing for substations for Bonneville project, to Lehigh Structural Steel Co., Allentown, Pa.

480 tons, Solvay Process Co., building extension, Hopewell, Va., to Virginia Bridge Co., Roanoke, Va.

350 tons, store building, for S. S. Kresge Co., Philadelphia, to Belmont Iron Works, Philadelphia.

335 tons, store, F. W. Woolworth Co., Springfield, O., to American Fabricators.

310 tons, bearing piles, improvement Los Angeles river, between Mariposa and Fletcher streets, Los Angeles, to Bethlehem Steel Co., Los Angeles.

305 tons, bottling plant, Frankfort Dist., Maryland, to Dietrich Bros., Baltimore.

300 tons, building, Square D Co., Milwaukee, to Austin Co., Cleveland.

280 tons, bridge 1897, Marion, Ind., to Pan American Bridge Co., New Castle, Ind.

270 tons, Bridge 1895, Norristown, Ind., Pan American Bridge Co., New Castle, Ind.

240 tons, vertical lift bridge over Lock Harbor, Gravel Switch, Ky., for T.V.A., to Lakeside Bridge & Steel Co., Milwaukee.

205 tons, Grant store building, Denver, to Midwest Steel & Iron Works Co., Denver.

200 tons, butterfly valves, Bonneville dam, Oregon, to Commercial Iron Works, Portland, Oreg.

200 tons, building, for Community Church of New York, to Weatherly Steel Co., Weatherly, Pa.

185 tons, grandstand, baseball park, Wilmington, Del., to Belmont Iron Works, Philadelphia.

170 tons, state bridge, Ayr, Nebr., to St. Joseph Structural Steel Co., St. Joseph, Mo.

170 tons, plant and office building, for Pepsi-Cola Bottling Co., Cleveland, to American Bridge Co., Pittsburgh.

155 tons, bridge FAP-77(A), Adams county, Nebraska, to St. Joseph Structural Steel Co., St. Joseph, Mo.

150 tons, alterations to Third avenue station, for Brooklyn Edison Co., Brooklyn, N. Y., to Belmont Iron Works, Philadelphia.

130 tons, million-gallon water tank, Texarkana, Tex., to Pittsburgh-Des Moines Steel Co., Pittsburgh.

130 tons, bridges, route 35, section 14, Middlesex county, New Jersey, to American Bridge Co., Pittsburgh.

120 tons, Thomas A. Edison bridge, Woodbridge, N. J., for state, to North American Iron & Steel Co., Brooklyn, N. Y.

115 tons, two oil barges, United States engineers, Cincinnati, delivery at Fernbank, O., to Equitable Equipment Co.,

115 tons, reconstruction of state bridge, Sixtieth street, Fresh Pond, N. Y., to American Bridge Co., Pittsburgh.

115 tons, Collins avenue bridge, Queens, N. Y., to American Bridge Co., Pittsburgh.

115 tons, Housatonic Junction bridge, Milford, Conn., to American Bridge Co., Pittsburgh.

115 tons, factory, Rheem Co., Chicago, to Bethlehem Steel Co., Bethlehem, Pa.

110 tons, state bridge, route 158, section 4-VF, Pleasant Hill, Ill., to Midland Structural Steel Co., Cicero, Ill.

105 tons, bridge TVA 193313, Chickamauga dam, Tenn., to Midland Structural Steel Co., Cicero, Ill.

105 tons, bridge, East avenue, Elmira, N. Y., for city, to American Bridge Co., Pittsburgh.

105 tons, bridge FAS & FAGM-163-A&B, Paulding county, Georgia, to Virginia Bridge Co., Roanoke, Va.

Shape Contracts Pending

2600 tons, including 1500 tons of sheet steel piling, graving dock at navy yard, Mare Island, Calif.; general contract to Ben C. Gerwick Inc., 112 Market street, San Francisco.

2000 tons, extension to furnace building and trestle, for International Harvester Co., South Chicago, Ill.

BUSINESS WEEK SAYS:

"Doors . . . should receive far more attention than they ordinarily do in factory planning, because they can have a direct effect on the flow of production."

Right!

And you can make sure of having doors that affect production the **right** way by installing Kinnear Rolling Doors. They will not only help keep traffic and production flowing smoothly year after year — they save time and money!

Kinnear Rolling Doors coil compactly above the opening. They open out of the way, out of view, out of reach of damage by wind or vehicles. They save floor and wall space, because they open **straight upward.** And their famous interlocking-slat construction forms a rugged all-steel curtain that not only stands the gaff of hard, daily use, but keeps intruders **out,** repels fire, and is weatherproof.

They operate quickly, smoothly and easily at all times. Snow, ice, swollen ground or similar obstacles can't get in their way. And if you wish, they can be operated electrically, with push-button controls at any number of convenient points.

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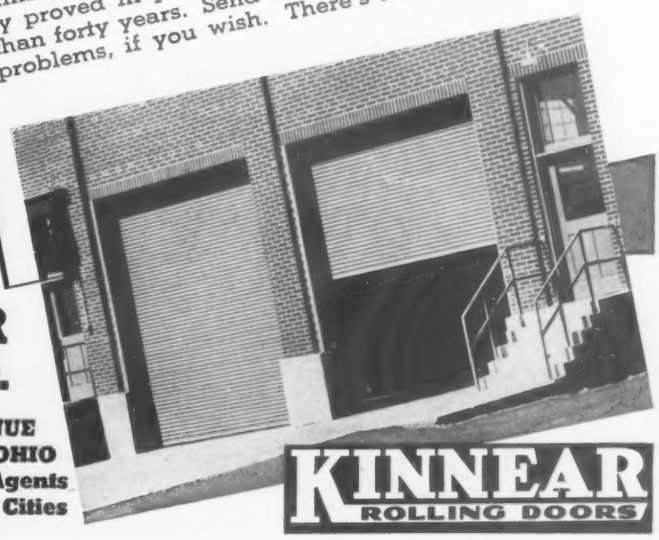

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1780 - 1800 FIELDS AVENUE
COLUMBUS, OHIO
Offices and Agents in Principal Cities

KINNEAR
ROLLING DOORS

750 tons, pots, for Aluminum Co. of America, Vancouver, Wash.

570 tons, state bridge PSC-4666, Cheektowaga, N. Y.

550 tons, ski jumping frame, World's fair, Flushing, N. Y., for Ski Cavalcade.

550 tons, state bridge over Salt river, Nelson-Hardin counties, Kentucky.

520 tons, state bridge PSC-6000, Rochester, N. Y.

500 tons, office building, Westinghouse Electric & Mfg. Co., Philadelphia; bids through United Engineers, March 21.

427 tons, including 105 tons of sheet steel piling, for Los Angeles county, California; bids March 13.

350 tons, plant addition, for Industrial Rayon Corp., Painesville, O.

340 tons, state bridge PSC-5388, Alden, N. Y.

320 tons, extension to diesel shop and lean-to, for American Locomotive Co., Schenectady, N. Y.

275 tons, mill buildings, for General Fireproofing Co., Youngstown, O.

270 tons, bridges over Pennsylvania railroad, Philadelphia, for city.

265 tons, skating rink, for Victor J. Brown, Newark, N. J.

250 tons, repairs to bridge 187.11, Howe, Ill., for New York Central railroad.

240 tons, building, for Longfellow Building Corp., Washington.

220 tons, state bridge FA-route 132, section 6-F-1, Fairmont City, Ill.

200 tons, Green Bay Manor housing project, New York, for city.

200 tons, recreation building, for Samuel P. Herkowitz, Albany, N. Y.

200 tons, additions to buildings, for Remington-Rand Inc., Elmira, N. Y.

200 tons, state highway bridges, Fairmont, Ill., bids March 15.

200 tons, housing project, Harrisburg, Pa.; Berwick Lumber & Supply Co., Berwick, Pa., low.

200 tons, state of Illinois, highway bridges; bids March 14.

180 tons, beam spans, Iowa, for Chicago & North Western railway.

175 tons, state of Arkansas, highway bridges, bids March 14.

160 tons, truss bridge, Lawrence county, Pennsylvania; bids to state highway department, Harrisburg, Pa., March 15.

158 tons, state of Missouri, highway bridges; bids March 27.

150 tons, state bridge PSC-5372, Medford, N. Y.

130 tons, state bridge, Potterville, Mich.

120 tons, store building, for Montgomery Ward & Co., Ithaca, N. Y.

120 tons, state bridge PSC-5386, Lackawanna, N. Y.

110 tons, bridge 36.42, Southport, Conn., for New York, New Haven & Hartford railroad.

110 tons, addition to office building, for Standard Oil Co. of New Jersey, Bayway, N. J.

110 tons, state highway bridge RC-40-8, Ballston Spa, N. Y.

110 tons, state highway bridge FAGS-SS-40-1, Niles, N. Y.

100 tons, bearing piles, Long Beach, Calif.; bids March 13.

Unstated, steel framing for fish hatchery, Entiat, Wash.; bids to Denver, March 22; Spec. 1338-D.

DAMASCUS

Manganese and Alloy Steel CASTINGS

FROM ½ TO 1000 POUNDS

1906 — 34 years — 1940

Produced in our modernly equipped foundry from electric furnace steel and heat-treated in automatically controlled gas-fired furnaces.

We are in position to manufacture specialties made of manganese and alloy steel castings and invite concerns to write us about their requirements.

DAMASCUS STEEL CASTING CO.
New Brighton, Pa.
(Pittsburgh District)

Reinforcing

Reinforcing Bar Prices, Page 87

Pittsburgh—Concrete reinforcing bar prices, irregular for a number of weeks, are still weak in most districts. Some rail steel bar producers have recognized this by anonouncing a reduction from the recent nominal market of 2.15c to 2.00c, a cut of $3 a ton. Extras are unchanged. Billet steel bars likewise are easy, with many jobs going at 1.90c, but producers merely are meeting competition without formal recognition of the lower market. Inquiries are more numerous with improvement in weather in northern and eastern sections.

Chicago—Pending business is increasing, partly the result of a large volume of small jobs. Most of the latter are for private construction, with larger lots principally for public works. Sellers look for an active spring demand.

Boston—Reinforcing steel inquiry is heavier, 3000 tons being required for a navy project, South Boston, and a pressure tunnel at Hartford, Conn. Awards are also up with 525 tons placed for the Mill river con-

duit, Springfield, Mass. More small projects are appearing, but bridge and highway programs lag. Prices are frequently shaded.

Philadelphia — Walker Bros., Chambersburg, Pa., are low on the last section in Bedford county of the Harrisburg-Pittsburgh express highway, taking 300 tons of bars. Small jobs generally predominate.

Toronto, Ont.—Reinforcing steel demand is gaining steadily. Contracts pending include 1000 tons for office building at Toronto for Ontario hydro electric commission; 700 tons for postal terminal at Montreal, for dominion department of public works; 500 tons for addition to Mont Ste. Anne convent, Lachine, Que.; 500 tons for two buildings for E. M. Craig & Co. Ltd., Vancouver, B. C., and 300 tons for store building at Vancouver, B. C., for Forsts Ltd.

Reinforcing Steel Awards

1050 tons, bureau of reclamation, invitation B-38,140-A, Odair, Wash., to Bethlehem Steel Co., Seattle.

900 tons, silos, Lone Star Cement Co., Hudson, N. Y., to Bethlehem Steel Co., Bethlehem, Pa., through Rust Engineering Co., Pittsburgh.

850 tons, bureau of reclamation, invitation 44,452-A, Earp, Calif., to Columbia Steel Co., San Francisco.

645 tons, improvement Los Angeles River channel between Mariposa and Fletcher streets, Los Angeles, to Truscon Steel Co., Los Angeles.

545 tons, Eel River bridge, Humboldt county, California, for state, to Columbia Steel Co., San Francisco.

525 tons, Mill river pressure tunnel, Springfield, Mass., to Carnegie-Illinois Steel Corp., Pittsburgh, through F. H. McGraw Co., Hartford, Conn., general contractor.

465 tons, Willowbrook state hospital, Staten Island, N. Y., 265 tons to Concrete Steel Co., through Andrews & Andrews Inc., New York, 200 tons to Bethlehem Steel Co., Bethlehem, Pa., through Silverblatt & Lasker Co., New York.

365 tons, Eel River bridge, Humboldt county, California, for state, to Soule Steel Co., San Francisco.

250 tons, superstructure, building 200, navy yard, Washington, to Republic Steel Corp., Cleveland, through Ceco Steel Products Corp., Omaha, Nebr.; Harwood-Nebel, contractors.

230 tons, school, Sisters of St. Dominic, Detroit, to Truscon Steel Co., Youngstown, O.; Darin & Armstrong, contractors.

210 tons, borough hall building, Kew Gardens, Queens, N. Y., to Igoe Bros., Newark, N. J.

180 tons, store, Sears, Roebuck & Co., Brooklyn, to Bethlehem Steel Co., Bethlehem, Pa., through Walter Kidde Co., New York.

170 tons, distributing plant for Safeway Store, San Francisco, to Ceco Steel Products Corp., San Francisco.

170 tons, ventilating building, Ray's Hill tunnel, Fulton county, Pennsylvania turnpike, to Truscon Steel Co., Youngstown, O.; Joseph F. Drass, contractor.

160 tons, intercepting sewer 10, Chicago, to Joseph T. Ryerson & Son Inc., Chicago; Santucci Construction Co., contractor.

146 tons, gymnasium for school of blind, Berkeley, Calif., to Soule Steel Co., San Francisco.

143 tons, bureau of reclamation, invitation B-13,697, Sawyer, Wash., to Bethlehem Steel Co., Seattle.

137 tons, state highway project 273, Licking county, Ohio, to West Virginia Rail Co., Huntington, W. Va.; Ralph Myers, contractor.

120 tons, bureau of reclamation, invitation 49,103-A, Port Chicago, Calif., to W. S. Wetenhall Co., San Francisco.

120 tons, state highway project 281, Hamilton, O., to Pollak Steel Co., Cincinnati; Midwest Roads Co., contractor.

105 tons, barrack addition, naval air base, Alameda, Calif., to Herrick Iron

Concrete Bars Compared

	Tons
Week ended March 16	**7,686**
Week ended March 9	**3,679**
Week ended March 2	**6,684**
This week, 1939	**8,552**
Weekly average, year, 1940	**7,206**
Weekly average, 1939	**9,197**
Weekly average, February	**5,457**
Total to date, 1939	**121,952**
Total to date, 1940	**79,266**

Includes awards of 100 tons or more.

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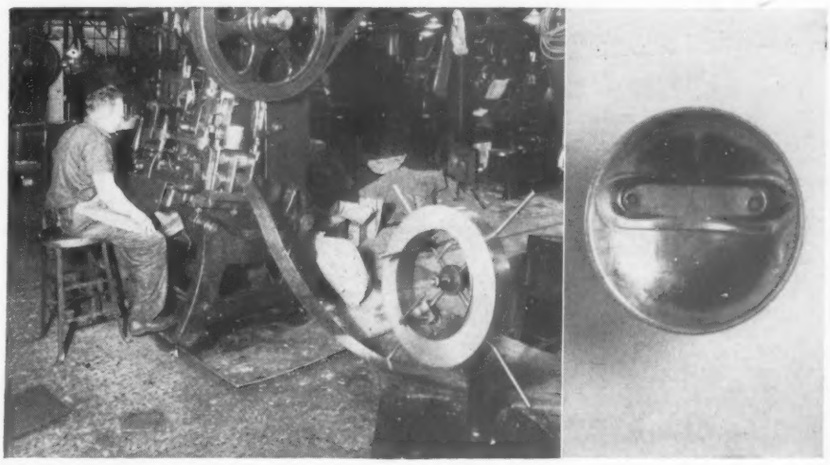

• Here's a tough drawing and forming job that *ordinary* galvanized metal would probably botch. Yet the coating on ARMCO ZINCGRIP coils is uninjured after running the gauntlet of dies in this feed press. No flaking, no peeling, because ZINCGRIP's specially-applied coating *sticks*. No costly hot-dipping either.

If you use or plan to use galvanized metal in manufacturing, it's likely you can do a better job and earn more profits with ARMCO ZINCGRIP coils. The use of coils can help you speed production, cut down scrap losses, fabricate easier and at less cost, and reduce your inventory of stock sizes. (One manufacturer, for example, reduced his stock from 51 to 6 sizes.)

Besides these money-saving advantages, ARMCO ZINCGRIP will prolong the service life of your galvanized products—and improve their appearance too.

Try ARMCO ZINCGRIP and you'll be pleasantly surprised at the results. It is available in open-hearth and copper-bearing steel or ARMCO Ingot Iron sheets and coils. Write The American Rolling Mill Co., 1010 Curtis St., Middletown, Ohio.

ARMCO ZINCGRIP

GIVES FULL PROTECTION

Behind the Scenes with STEEL

Amazing Fact No. 732

■ *Things you probably never knew 'til now*: The steel industry, when it operates at capacity, (or should we say "if") consumes 4,000,000,000 gallons of water daily for steam and cooling purposes. This is four times the daily consumption of New York City.

Composite Report

■ This is the open season for annual reports to stockholders and we especially liked this one appearing (pretty much as given here) in a recent issue of the N. Y. *Herald-Tribune*: Your officers are glad to report business over the last year has been vastly improved, in fact we almost broke even. Much of the company's success during 1939 was due to a more vigorous policy of trying to make the best of it all. During the fiscal year, 70 per cent of the officers have cut their worrying down 86½ per cent. In addition to naming six vice-presidents in charge of visits from tax agents, we built a new wing on the factory in which all data, facts, figures, reports, explanations and apologies demanded by the government may be prepared and turned out. This plant is capable of answering 50,000 inquiries from Washington per week. Our cash position is strong due to a new system of loose-leaf, loose-thinking and loose-figuring bookkeeping, now quite the rage. This means a lot of good clean fun until we change auditors. Getting down to figures, our losses for 1939 were $1,348,436 against a loss of $2,267,233 for 1938. This makes it a banner year. *Summary*: The general outlook is good. Car loadings are doing nicely. Boat loadings are firm. Auto loadings are improving. Bicycle loadings are not to be sneezed at. Our stockholders will be glad to hear that after suspending the custom over the lean years, we have decided to renew distribution of art calendars to all stockholders. Please notify the company of any change of address so that you may be kept in touch with all bad news.

Next Week

■ In next week's issue of STEEL Clarence B. Bartlett reveals that the social security tax system may be an asset instead of a liability to the smart manufacturer. That is really sumpin', so don't miss it. In the same issue R. J. Cowan, metallurgical engineer, Surface Combustion Corp., will tell some things about various properties of malleable iron that every machinery manufacturer will want to know.

The Pay-Off

■ At this late and embarrassing date, we find that last week's puzzle contributor forgot to tell how far the army traveled, which was its own length. If you assumed this, the courier then covered 48.3 miles. We're big-hearted, though, and are shooting out a stogie to everyone who came close.

Sharpen Your Pencil

■ MacCulloch (Schwab Safe Co.) Vaughan offers this one, and at the same time apologizes for having gotten three different answers himself. Only one is correct, however: Two painters are painting two houses. One has his ladder braced against the north house at the point where the foundation meets the earth. The other has his ladder braced in the same manner against the south house. Each, of course, leans against the opposite house. The ladder of the first painter is 40 feet long; the ladder of the second painter is 50 feet long. The point where both ladders intersect is 10 feet above the ground. How far apart are the houses? That one is worth an 80-page booklet, "How to Handle Materials Profitably."

SHRDLU

Works, Oakland, Calif.

100 tons, state procurement office, WPA, Sidney, Iowa, to Sheffield Steel Corp., Kansas City, Mo.

100 tons, state highway project, Plaistow, N. H., to Truscon Steel Co., Youngstown, O.

Reinforcing Steel Pending

7000 tons, Panama Canal barracks; Tucker & McClure, Los Angeles, low.

1500 tons, Park river conduit and dike, Hartford, Conn.

1200 tons, waterfront development, Boston; Merritt Chapman & Scott Co., New York, low; also involves 1500 tons of sheet piling and 4000 tons of H piling.

1050 tons, for Coulee dam; Pacific States Steel Co., Niles, Calif., low to reclamation bureau.

800 tons, South housing, New Bedford, Mass.

730 tons, Clearwater reservoir, Piedmont, Mo., for army engineers.

700 tons, graving dock, Mare Island, Calif., navy yard; Ben C. Gerwick Inc., 112 Market street, San Francisco, awarded general contract.

600 tons, McCullough homes, Baltimore; bids March 27.

430 tons, Fern Ridge dam, Lane county, Oregon; Morrison-Knudsen Co., Boise, Idaho, low to United States engineer, Portland, Oreg.

359 tons, procurement division, United States treasury department, Lansing, Mich.

350 tons, subway, section S-10-A, Chicago; bids March 21.

300 tons, express highway, Bedford county, Pennsylvania, Walker Bros., Chambersburg, Pa., low.

300 tons, storage tanks, for Spencer-Kellog, Decatur, Ill.

238 tons, state highway project, Nelson and Hardin counties, Kentucky; bids March 22.

200 tons, box factory, W. C. Ritchie Co., Chicago.

150 tons, addition to plant, Industrial Rayon Corp., Painesville, O.; bids March 15.

150 tons, State of Arkansas, highway bridge, bids March 14.

120 tons, storage tanks, Swift & Co., Champaign, Ill.

100 tons, public opening, Saginaw, Mich.; bids March 12.

Pig Iron

Pig Iron Prices, Page 88

Pittsburgh—Blast furnace operations make a much more favorable comparison with a year ago than does steel ingot production. This is caused largely by the increased proportion of iron employed in steelmaking. Buying of merchant iron is light, foundries generally being covered by old contracts. Low inventories aid the outlook for heavier releases the next few weeks.

Cleveland—Orders and releases have been more active lately, but the change does not constitute a general upward trend. Foundry operations are steady and fairly heavy, with casting needs of machine tool builders outstanding. Spot buying continues light, but March

shipments of foundry iron will compare favorably with the February movement.

Chicago—Both pig iron and by-product foundry coke shipments are near the rate a month ago. Gain is expected in iron movement before April. Buying has increased somewhat, about half of it involving second quarter orders at the prevailing $23. Foundry melt is well maintained. Steelworks needs are still light. Diminishing foundry stocks of iron presages heavier releases.

Boston—Second quarter covering by pig iron consumers is light, and new buying is confined mostly to spot lots for prompt delivery. While some larger consumers will be forced to add to supplies next quarter, most are well stocked. Foundry melt is fairly well maintained, notably for machine tool castings.

New York—Specifications have increased slightly so far this month. Several larger consumers still have fairly sizable stocks, but smaller melters have little tonnage on hand and are specifying more freely. Export inquiry continues brisk, with orders fair. Removal of immediate threat of broadening of the late Finnish war into northern Europe may result in less active pig iron demand from Scandinavia, it is thought, although milder weather will permit movement of iron by water from ocean ports there to inland consuming points.

Philadelphia — A district steel foundry may supplement its recent purchase of 1000 tons of basic iron, but the market shows little activity. Gray iron foundries are operating three to five days weekly but are well covered except for some fill-in needs. Export demand includes 5000 tons for Belgium

Buffalo—Pig iron continues to resist downward tendencies. Ten of the district's fourteen stacks continue in operation for an output rate of 71 per cent. Volume for March is well sustained above February.

Cincinnati—Opening of second quarter books brought in some coverage for forward needs, but such tonnage is relatively small. Spot buying is slow. Consumption is little changed, and shipments continue near the February level. Demand for stove castings is lagging.

St. Louis—Reaffirmation of first quarter prices on pig iron, as announced by makers during the week, was as expected by melters. The announcement had no effect on buying, there being no incentive to make forward commitments. Shipments against contracts show some improvement, but new business is light.

Birmingham, Ala.—Production is steady, with two blast furnaces down, one for repairs and one for relining, but demand is relatively light.

Toronto, Ont.—Merchant pig iron sales are gaining, with awards for the week in excess of 2000 tons. Most demand is from small melters. Inquiries for second quarter indicate larger commitments for that period. Deliveries total about 4000 tons weekly, while production is at a peak of around 85 per cent.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 87

A leading eastern seller of bolts and nuts has reaffirmed published prices for second quarter, and other interests are expected to follow suit. Demand is improving gradually as buyers work off stocks, and this trend is expected to continue into April.

Scrap

Scrap Prices, Page 90

Pittsburgh—Scrap continues dull. Brokers are paying $17 and occasionally more to fill orders for No. 1 steel taken at $17, and the mar-

LARGE INDUSTRIAL PLANT

Now Being Split Up for Industries Looking for New or Additional Plant Locations

The James B. Clow and Sons have consolidated their various operations, making the larger portion of their Newcomerstown, Ohio plant available to other industries. The buildings vary sufficiently in size, type and construction to accommodate requirements of most any type of industry.

Buildings are generally in good repair, have R. R. sidings and can be occupied immediately. Active cooperation will be extended by city to make your coming to Newcomerstown possible.

LOOK OVER THIS LIST OF DESIRABLE EQUIPMENT

- 10 Electric overhead Cranes all sizes and spans some with outside runways
- 1 5-ton Niles Monorail Crane
- 1 Pipe testing press 3" to 24" pipe
- 1 39" pipe testing machine, 30" to 48" pipe
- 2 446 cu. ft. Ingersoll-Rand compressors—motor driven
- 1 54" Putman lathe
- 1 36" Pond engine lathe
- 1 32" Amer. lathe
- 1 72" Wood Light Co. lathe
- 1 72" Betts lathe
- 1 96" Bement lathe
- 1 36 Horiz. multi 20 spindle drill Manning, Maxwell and Moore
- 1 72" Bickford radial drill
- 1 Simpson sand mixer
- 3 Curtis air hoists
- 1 12" Pipe threader
- 1 60" x 60" x 30' Bement planer
- 1 42" Putman lathe

ALSO LOCATED AT OTHER JOBS

- 1 Billet lifting magnet
- 4 Milling machines
- 1 Cincinnati planer
- 1 Sheppard floor operated crane with lifting beam full length
- 50 Hand single beam cranes 15'-20' spans
- 5 Centrifugal motor driven pumps
- 1 H & P lime and water softener complete with Moffet feed water heater and oil extractor
- 1 Chicago pneumatic 9 x 11 belted compressor
- 1 Ingersoll-Rand 9 x 8 belted compressor
- 1 Ding's magnetic separator pulley

COMPLETELY EQUIPPED FOUNDRY AVAILABLE AT NEWCOMERSTOWN

HETZ CONSTRUCTION CO., INC.
WARREN, OHIO

ket for this grade now is $16.75 to $17.25, off 25 cents from the recent nominal range. Mills are not pressing for delivery. Railroad specialties are firm, and blast furnace grades are stronger. Cast grades are steady and low phos material has been sold at both the quoted range and slightly higher.

Cleveland—Quiet continues and only few carloads are being shipped, usually factory material. Dealers believe renewed buying is imminent. Prices are unchanged, largely nominal.

Chicago—Additional purchases of No. 1 heavy melting steel and companion grades by a leading mill have continued the prevailing quotation of $16. The market, however, is again quiet, with trading reported within the quoted range of $15.50 to $16. Dealers sold some tonnage at $16, but more recently at $15.75, and it is expected that soon the full range of the quotation will be in effect.

Boston—Scrap prices are steadier. The decline has halted temporarily at least, but prices have made little progress toward regaining some of recent reductions, although heavy cast is 25 to 50 cents higher. Domestic demand continues dull, both for district delivery and shipment to eastern Pennsylvania. Boat loading is more active for export and buying for dock delivery is heavier at unchanged prices.

New York—Heavy melting steel grades for barge delivery for export have been reduced 50 cents, $13.50 now being paid for No. 1 and $12 for No. 2. No. 2 cast is also reduced 50 cents. Buying for barge delivery is light and although two British ships are loading about 15,000 tons, this is being supplied from accumulations, some of which has been on barges since the first of the year. Domestic buying is light and shipments few. Foundries are buying cast grades in small lots with prices generally unchanged.

Philadelphia—Additional business is reported in No. 2 cast at $16, heavy breakable at $18.50 and stove plate at $15.50. No additional sales of heavy melting steel are reported. Steel grades are regarded as slightly on the weak side, due to the restricted export movement resulting from lack of boats, but cast scrap appears firm. Coverage of export orders is on the basis of $15 for No. 2 steel and $16 to $16.25 for No. 1.

Buffalo—Dealers now have about 35,000 tons on books following recent sales. While consumer interest has subsided, one mill is willing to acquire additional tonnage at 50 cents below the current $16.50 to $17 range for No. 1 steel. Dealers so far have been unwilling to recognize this bid. The weather again is restricting scrap movement from rural areas.

Detroit—Scrap markets show no change from dullness prevailing for about six weeks. Bids closed on over 300 cars of No. 1 bundles from automotive sources last week and while prices were reported a shade weaker, the spread of $13 to $13.50 is still believed representative.

Cincinnati—Market continues slow, with lower prices sought by large consumers. Foundry shipments are steady and favorable prices have increased the proportion of scrap in the melt.

St. Louis—Dealers advanced prices 25 to 50 cents a ton to stimulate offerings, with a 50-cent rise in bundled sheets and tin clippings attributed to speculation. Mills are out of the market. Railroad lists: Louisville & Nashville, 4900 tons; Wabash, 3000 tons; Gulf Coast Lines, 1400 tons; Ann Arbor, 600 tons; Chicago & Eastern Illinois, 375 tons.

Birmingham, Ala.—Scrap prices again tend downward, with the larger buyers inactive.

Seattle—While export business remains nominal, dealers find it difficult to find space for the few orders being placed. Freights on berth lines are $12 or higher. Firm scrap quotations are not available and prices are unstable. Mills are not buying, although one sale from the country was reported at $10.50. Local mills state they are still on a gross basis, notwithstanding reports from California that buying had changed to net ton.

Toronto, Ont.—Better tone is reported in scrap markets. While prices are unchanged, firmness is developing and some dealers look for early advances. Offerings to dealers also are increasing as weather improves, although northern Ontario supplies still are held in snow-covered yards. Mills are placing contracts as far ahead as dealers will permit and also are taking all steel scrap offered. Demand for cast scrap and stove plate is improving.

San Francisco—Movement of scrap is confined to replenishing stocks and no new orders for material for export to Japan are noted. The market is weak and further reductions in heavy melting steel, compressed sheets and turnings and borings are expected. No. 1 heavy melting steel, f.o.b. cars, metropolitan district, San Francisco and Los Angeles, holds at $12.50 to $13 a net

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Simple disc-type design, with the bronze disc ground and lapped to make a perfect seal with the seat, does away with packing, prevents leakage and waste of air power. Hannifin Air Control Valves give positive and accurate control for any type of air operated equipment.

Made in 3-way and 4-way types, hand and foot operated, manifold, spring return, rotary, electric, and special models. Write for Valve Bulletin 34-S.

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ton, with No. 2 at $11.50 to $12. Prices anticipated within the near future indicate $11 to $11.50, f.o.b. cars metropolitan district, net ton basis, for No. 1, $10 to $10.50 for No. 2 and $9 to $9.50 for compressed sheets.

Warehouse

Warehouse Prices, Page 89

Chicago—Orders so far in March are on a par with the volume a month ago, with a moderately upward trend in prospect for the next 60 to 90 days. Building products continue rather slow.

Buffalo—Recent improvement in demand has leveled out. Buying is somewhat spotty and while well ahead of a year ago, a slight reduction is shown compared with early March.

Cincinnati—Sales have spurted, the first so far this quarter. Despite promise of better weather, inquiries for building materials are light.

Seattle—Improved weather conditions have increased sales. Public works projects are furnishing considerable business but demand from private sources has increased. Buying is in small lots, only occasional car lot orders.

Steel in Europe

Foreign Steel Prices, Page 89

London—(*By Cable*) — Following increase in the price of scrap in Great Britain a rise in iron and steel prices is expected April 1. Demand is further outpacing production and national requirements are more closely restricting ordinary business until little is left for export except rolling stock. Semifinished steel is coming from the Continent, the Dominions and America.

British Iron and Steel federation, board of trade and the British motor trade have reached an agreement that when present steel contracts are completed future supplies to motor manufacturers will be limited to requirements for export vehicles and domestic commercial cars, no more steel to be supplied for private pleasure motor cars.

Belgium and Luxemburg report little change and works are well booked, mainly for Great Britain home markets and nearby destinations.

Ferroalloys

Ferroalloy Prices, Page 88

New York—Reaffirmation of ferroalloy prices for second quarter removes the occasion for protective buying the remainder of March, but movement of ferromanganese and other alloys is expected to be somewhat larger this month than in February. This is due partly to the longer month.

Ferrotungsten is easier at $1.90 to $2 per pound of contained tungsten in carlots.

Equipment

Chicago—Government work is a prominent factor in present machinery business, as inquiries are numerous and considerable business is being placed for navy yard and air corps requirements. As a whole, machinery inquiries are heavy, while a number of older projects also are becoming more active. Sellers, however, report actual orders at a slow rate, and at least one large interest finds bookings somewhat behind the same period in last month. Though business is spotty, it is expected March will catch up with February volume before the month is over. Aside from government work, present demand comes from the usual wide range of manufacturing and fabricating interests.

Seattle — Graybar Electric Co., Portland, Oreg., is low to Bonneville project, $92,000, for furnishing sixty 115-kv and 196-kv disconnecting switches for substations at Ampere, Verinta, Napavine and Ellensvurg. Same agency will open bids March 26, Spec. 847, for a 115-kv transmission line between Van-

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for Superior Welding at Lower Welding Cost

Page-Allegheny Stainless Steel Electrodes were an important factor in the fabrication of many vessels identical with the one shown above.

The welding was done rapidly—and so well that the vessels were able to pass the severest tests with flying colors.

Page-Allegheny Stainless Steel Electrodes are smooth-flowing rods—and welds made with them will stand rigid inspections and tests for strength, penetration and structure. The welds will polish perfectly to conform to the parent material.

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couver and Alcoa, Wash. Leavenworth, Wash., will receive tenders March 26 for machinery and equipment required in a 200,000-gallon daily sewage disposal plant.

FINANCIAL

(*Concluded from Page 23*)

compared to $337,965 deficit incurred in 1938 and $1,057,639 net profit earned in 1937.

J. T. Whiting, president, in his letter to stockholders, said company's business last year followed very closely the pattern of industry in general. Early months showed good volume and profits; from April through August volume fell so that but small profit could be shown. Beginning with September, however, sales soon improved enough to require company's entire facilities.

Recent incoming orders, said Mr. Whiting, indicate operations over next few months will be at sufficiently high rate to return a profit if current prices can be obtained.

Ingot production in 1939 totaled 281,472 gross tons, compared with 169,772 produced in 1938. Blast furnace department operated at 56 per cent of capacity last year, compared to 29 per cent in 1938; blooming mill department at 37 per cent against 26 per cent; plate mill department at 76 per cent compared to 48 per cent; and sheet mill department at 50 per cent compared to 23 per cent in 1938.

Funded debt, excluding bonds maturing before Dec. 31, 1940, was $770,000, $115,500 less than $885,500 reported at end of 1938.

Taxes paid last year totaled $469,891, compared to $256,729 in previous year and $783,546 in 1937.

Dividends aggregating $3.50 a share and totaling $251,384 were paid stockholders on account of accumulations during 1939.

CRUCIBLE STEEL'S 1939 NET EARNINGS TOTAL $2,803,596

Crucible Steel Co. of America, New York, reports net 1939 income of $2,803,596, equal to $2.54 a share on common after allowance for regular preferred dividend charges. This was a sharp rebound from $2,237,026 net loss incurred in previous year. Net profit of $4,017,931 or $5.21 a share on common was earned in 1937.

Sales for 1939 were $47,967,538, nearly 65 per cent greater than $29,125,598 in previous year but only 81 per cent as high as in 1937, when sales total was $59,852,703.

Discussing, in his letter to stockholders, company's financial condition and results of last year's operations, F. B. Hufnagel, chairman, held out hope settlement of problem of $37.25 arrearages per share on preferred stock as of Dec. 31, would be made before July 1. Arrearage at year's end totaled $8,895,300, will include additional $835,800 by June 30 if nothing is paid meantime.

Bulk of 1939 income, Mr. Hufnagel pointed out, was earned in last four months when larger volume of business developed.

Earnings, according to Mr. Hufnagel, came more from high grade specialty steel business than from lower grade semifinished and bar divisions last year. Despite decrease in current orders, however, there are reasons to believe steel industry will suffer no serious setback in near future.

Company's ordnance division received several substantial orders from United States government last year. Mr. Hufnagel said definite prospects are additional orders will be booked by United States and several foreign governments.

Expenditures for additional equipment, replacement and maintenance totaled $4,336,735. Improvements made, said Mr. Hufnagel, enabled company to meet more efficiently and economically large demand for specialty steels which developed in latter part of 1939. Further im-

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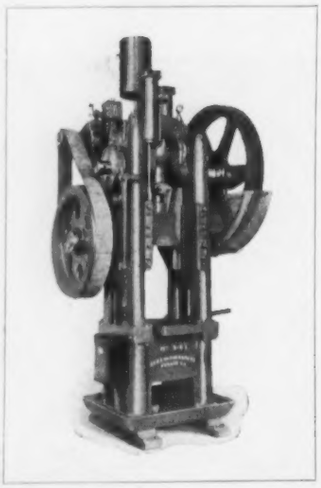

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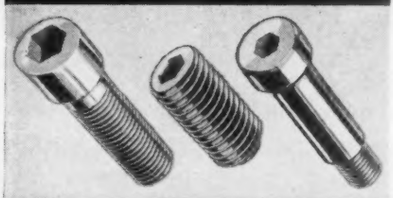
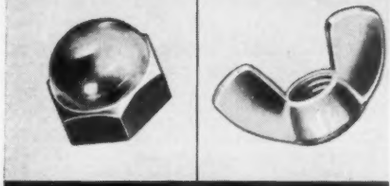
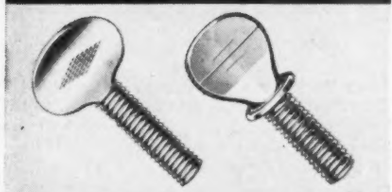


Cap Nuts Wing Nuts



Thumb Screws



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PRODUCTS of an improved process developed through years of experience in the manufacture of precision screw products, Parker-Kalon *Cold-forged* Socket Screws, Cap Nuts, Wing Nuts and Thumb Screws possess that *strength, uniformity* and *accuracy* that spell Q-U-A-L-I-T-Y. Stocked by reliable industrial distributors near you. Write for free samples . . . compare . . . see for yourself.

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provements, under way, should lower production costs still more, he added.

Inventories increased from $13,581,066 in 1938 to $17,781,306, larger than 1937's $16,352,666. Increase represented principally raw materials, Mr. Hufnagel said, including ferromanganese, tungsten and other alloys, supply of which is largely in other countries.

Income account summary:

	1939	1938	1937
Net sales	$47,967,538	$29,125,598	$59,852,703
Op't'g prof.	3,874,931	1,787,204*	5,511,120
Tot. income	3,992,142	1,763,177*	5,543,028
Net earnings	2,803,596	2,237,026*	4,017,931
Current as'ts	27,810,970	21,557,915	21,786,516
Current liab.	6,701,832	2,757,155	5,741,417
Earned surp.	21,664,638	18,861,042	21,668,674

*Loss.

EASTERN ROLLING MILL REPORTS 1939 NET LOSS

Eastern Rolling Mill Co., Baltimore, reports $77,425 net 1939 loss, compared to $375,871 net deficit incurred in previous year. Company earned $121,667 net income in 1937. Fourth quarter net profit was $30,498, equal to 15 cents a share on common, against net loss of $107,951 incurred in same 1938 period.

Net sales last year were $3,082,080, compared to $2,181,543 in 1938. Operating profit was $46,389, against net loss of $231,112 in preceding year.

Nonferrous Metals

New York—Activity in nonferrous metal markets centered in tin last week following the decree by the British government that tin exports must be paid for in foreign or "official" sterling. Copper, lead and zinc consumers are well covered on nearby needs and bought only light tonnages at steady prices.

Copper—Due partly to war-created uncertainties consumers reduced their purchases to the slowest rate in about six weeks. Electrolytic held unchanged, however, at 11.50c, Connecticut, in the producers' market and fractionally higher in the resale and export markets, reflecting in part limited offerings for nearby delivery. United States refined stocks increased 9952 tons last month as deliveries declined to 63,215 tons from 91,428 tons to domestic buyers and to 9594 tons from 13,117 to export buyers. Refined output rose to 82,761 tons from 80,501, while blister output declined to 76,194 tons from 89,598.

Lead—At least one leading seller balanced his intake on two or three days while other sellers reported only moderate daily demand. Prices held at 5.10c, East St. Louis.

Zinc—Sentiment has been buoyed by the continued active rate of shipments which is running at about three times the rate of new bookings. Galvanized sheet output has eased further, however, to about 53 per cent of capacity.

?

HAVE YOU SEEN RUST QUIZ

in the January 1st and February 5th issues of STEEL

THE FLOOD CO.
MANUFACTURERS OF PENETROL
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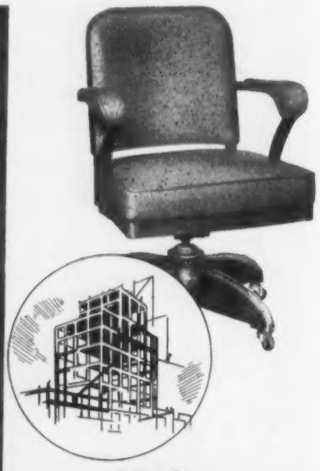
PENETROL
STOPS RUST ON STEEL

Prime western zinc held unchanged at 5.75c, East St. Louis.

Tin—Trading was restricted due to confusion resulting from the new exchange regulation in Great Britaino. Straits spot jumped to 49.00c on Monday and then eased steadily to close at around 47.25c. Resale offerings likely will set the price pace here until they are absorbed. The official sterling rate is about $4.04, including commission, compared with the free rate of only about $4.70. Higher tin prices are expected on any improvement in the present slow buying pace.

CHAIRS SMARTLY STYLED IN STEEL



Modern Office Chairs—Built to Endure

Harter Steel Chairs, for fine offices, are noteworthy for their ease and comfort—for their modern flowing lines and for their sturdiness.

Chairs in the Columbian Suite, illustrated above, are equipped with moulded form rubber cushions. This is in line with the latest trend, for wherever comfort is of paramount importance in seating, there you will now find foam rubber in use.

More and more business leaders are turning to Harter. They know that in so doing they will get smartly styled steel chairs—chairs that offer the last word in comfort plus extra long wear.

These business leaders also know that Harter Posture Chairs are outstanding in the posture chair field. Harter Posture Chairs are designed to make good sitting posture easy and natural. There is a Harter chair for every type of seated work. The Harter Corporation, Sturgis, Michigan.

HARTER

Nonferrous Metal Prices

Mar.	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin, New York: Spot	Straits Tin, New York: Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
9	11.50	11.50	11.25	49.00	49.00	5.25	5.10	5.75	20.00	14.00	35.00
11	11.50	11.50	11.25	49.00	49.00	5.25	5.10	5.75	20.00	14.00	35.00
12	11.50	11.50	11.25	48.75	48.75	5.25	5.10	5.75	20.00	14.00	35.00
13	11.50	11.50	11.25	48.12½	48.00	5.25	5.10	5.75	20.00	14.00	35.00
14	11.50	11.50	11.25	47.50	47.50	5.25	5.10	5.75	20.00	14.00	35.00
15	11.50	11.50	11.25	47.25	47.25	5.25	5.10	5.75	20.00	14.00	35.00

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 11.50c Conn. copper

Sheets

Yellow brass (high)	18.31
Copper, hot rolled	20.12
Lead, cut to jobbers	8.50
Zinc, 100 lb. base	11.00

Tubes

High yellow brass	21.06
Seamless copper	20.62

Rods

High yellow brass	14.26
Copper, hot rolled	16.62

Anodes

Copper, untrimmed	17.37

Wire

Yellow brass (high)	18.56

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	7.25-7.50
Cleveland	8.25-8.50
Chicago	7.75-8.00
St. Louis	7.75-8.25

Heavy Copper and Wire

New York, No. 1	9.00-9.25
Cleveland, No. 1	9.25-9.50
Chicago, No. 1	9.00-9.25
St. Louis	8.75-9.25

Composition Brass Turnings

New York	7.00-7.25

Light Copper

New York	7.00-7.25
Cleveland	7.25-7.50
Chicago	7.00-7.25
St. Louis	6.75-7.00

Light Brass

Cleveland	4.25-4.50
Chicago	4.50-4.75
St. Louis	4.50-4.75

Lead

New York	4.50-4.75
Cleveland	4.00-4.25
Chicago	4.25-4.50
St. Louis	4.00-4.25

Zinc

New York	3.00-3.25
Cleveland	2.75-3.00
St. Louis	3.25-3.50

Aluminum

Mixed, cast, Cleveland	8.75-9.00
Borings, Cleveland	6.75-7.00
Clips, soft, Cleveland	15.75-16.00
Misc. cast, St. Louis	8.75-9.00

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads	12.00
Standard No. 12 aluminum	14.50-14.75

Construction and Enterprise

New York

NEW YORK—Frank M. Bellanca, president, Bellanca Aircraft Mfg. Co., 122 East Forty-second street, New York, plans aircraft manufacturing plant at Mobile, Ala., or Biloxi, Miss., to cost $500,000.

NEW YORK—Atlantic Steel Partition Co. has been incorporated to manufacture steel partitions by Henry Schantz, 274 Madison avenue, New York, with 300 shares preferred, 150 shares no par value.

SYRACUSE, N. Y.—Onondaga Tool & Salvage Corp. has been incorporated with $1000 capital to deal in tools and machinery, by May Osofsky, 2002 State Tower building, Syracuse, N. Y.

Connecticut

EAST HARTFORD, CONN.—Hamilton Standard Propeller division, United Aircraft Corp., has let contract to R. G. Bent, Hartford, Conn., for an addition to its plant.

Pennsylvania

PITTSBURGH — Independent Erection Co., Century building, Pittsburgh, has been awarded contract by Curtis-Wright Corp. for an addition to its airplane propeller plant at Neville Island, Pittsburgh.

Ohio

ASHLAND, O.—City, Howard S. Lutz, mayor, is preparing plans for a water softening plant costing $40,000. Provides space for two low-lift and two high-lift pumps and other equipment. E. D. Barstow, 31 North Summit street, Akron, consulting engineer.

CLEVELAND — Thompson Products Inc., 2196 Clarkwood road, Cleveland, is increasing plant by adding 120,000 square feet floor space, for aircraft parts production.

DAYTON, O.—National advisory committee of aeronautics, Washington, is seeking government approval for an airplane engine laboratory at Dayton, to cost about $2,000,000. Committee is a civil-government institute not directly connected with the army.

MARTINS FERRY, O.—City, Walter Lipphardt, service director, is preparing plans for extension to electric light plant. Burns & McDonnell Engineering Co., Linwood boulevard, Kansas City, Mo., is engineer.

Michigan

DEARBORN, MICH.—Faigle Tool & Die Corp., 6500 Chase road, Dearborn, has been incorporated to manufacture dies, by Karl Faigle, 1100 Hubbard avenue, Dearborn, with $50,000 capital.

DETROIT—Superior Tool & Die Co., Detroit, is having plans prepared by the Austin Co. for a $60,000 factory at Charlotte, Mich.

DETROIT—Motor Valve & Mfg. Co. has been incorporated to manufacture electrical and automotive equipment, with $125,000 capital, by Grand L. Cook, 2730 Union Guardian building, Detroit.

HOLLAND, MICH.—Holland Precision Parts Co., has let contract to Krieghoff Co., Detroit, for a plant, 200 x 360 feet.

MIDLAND, MICH.—Dow Chemical Co.,

SCREENS of Perforated Metal

The Harrington & King Perforating Co.

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JIGS—FIXTURES—SPECIAL MACHINES—PUNCHES—DIES—*"to your measure"!*

Let our trained engineers apply our 34 years' experience to your equipment problem. Our successes in other plants of all types, and proved methods assure a solution of any question involving production machinery. Write us in detail without obligation.

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HOT-DIP GALVANIZING PRACTICE 450-S.F.

By W. H. Spowers Jr.

• This 200-page book, gives full and carefully reasoned explanations of the why and wherefore of galvanizing. All the latest methods and processes are described and very copiously illustrated by a large number of diagrams and photographs. 45 Illustrations—4 Tables—7 Charts—61-page Bibliography. Price Postpaid $4.00.

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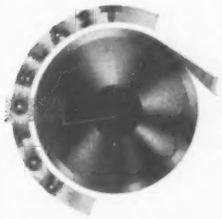
CUTS COST - - - INCREASES BLAST CLEANING PRODUCTION

On every count—speed, utility, quality of finished product, low maintenance and low operating cost—ROTOBLAST equipped units are superior to anything accomplished throughout the 36 years we have been designing and building successful Blast Cleaning installations.



The ROTOBLAST has EXACT ABRASIVE STREAM CONTROL—DOWNWARDS, UPWARDS and SIDEWAYS. It feeds abrasive to the vanes without crushing—with less power consumption—and at reduced maintenance. It is THE CLEANING UNIT of 1940—and warrants your careful consideration before buying any similar product. Furnished with Pangborn Airless Cleaning Barrels, Tables, Cabinets and Special Machines.

CASTING WASHERS—Another outstanding Pangborn success for quick, economical cleaning of large castings—with removal of core sand, rods, etc., without chipping, without damage, without dust.

DUST CONTROL SYSTEMS—All steel frame, cloth screen Dust Collectors for every possible requirement.

PANGBORN CORPORATION
World's Largest Manufacturer of Blast Cleaning and Dust Control Equipment
HAGERSTOWN . . . . MARYLAND

Dr. Willard H. Dow, president, has authorized purchase of 800 acres with harbor frontage at Freeport, Tex., for a projected plant. Austin Co., 16112 Euclid Avenue, Cleveland, engineer.

SAGINAW, MICH.—General Motors Corp., Detroit, is having plans prepared by Frantz & Spence, Saginaw, for a plant 150 x 160 feet for its Saginaw steering division.

Indiana

ELKHART, IND.—Elkhart Screw Products Inc. has been incorporated to manufacture machine tools, with 1000 shares no par value stock. Incorporators are Harold Anderson, Hugo Havlish and C. Whitney Slabaugh.

SOUTH BEND, IND.—Hoyt Screw Machine Products Co., Charles D. Hoyt Sr. owner, will move its plant to Mishawaka, Ind., as soon as a new building is completed.

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Manager

Every Room Outside with Private Bath
Single from $2.50
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DETROIT LELAND HOTEL

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GARAGE IN CONNECTION

Delaware

WILMINGTON, DEL.—E. I. du Pont de Nemours & Co., is considering location of two powder plants in Tennessee at cost of $500,000 each, near Nashville and Memphis; also plans Nylon plant near Nashville.

District of Columbia

WASHINGTON—Public buildings administration of federal works agency, Washington, will receive bids March 27 for construction of terminal building and four hangars at Washington National airport on Gravelly Point. Terminal will be three stories, hangars will be 207 x 240 feet, 55 feet high. Total cost $2,500,000.

Missouri

ST. LOUIS—Emerson Electric Mfg. Co., 1824 Washington avenue plans erection of new plant in outer section of city.

TIPTON, MO.—Gall Construction Co., Milwaukee, Wis., is low bidder for construction of 143 miles of rural transmission lines for Co-Mo electric co-operative, Thomas C. Briscoe, president. A. Y. Taylor & Co., Central building, Clayton, Mo., are consulting engineers.

WEST PLAINS, MO.—Howell-Oregon electric co-operative has awarded contract to Ziegler Construction Co., Nashville, Tenn., at $165,620, for 297 miles of rural transmission lines serving 540 customers in Howell county. Midwestern Engineering & Construction Co., McBirney building, Tulsa, Okla., is consulting engineer.

Kansas

CLAY CENTER, KANS.—Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., consulting engineers, are preparing a survey for enlargement of the city's power plant. Clay C. Smith is mayor.

North Dakota

GRAND FORKS, N. DAK.—Nodak rural electric co-operative, J. Donnelly, president, has submitted plans to REA for construction of a diesel-powered plant of three units, 500 kilowatts, ultimately five units, to supply power for 1000 miles rural electrification lines: cost $225,000. Ellerbe & Co., 1021E First National Bank building, St. Paul, Minn., is consulting engineer.

South Dakota

RAPID CITY, S. DAK.—Black Hills electric co-operative, Stephen Kyte, secretary, has been allotted $200,000 for construction of 200 miles of rural transmission lines in southern Black Hills. Walter Walkling, 1110 St. Cloud street, Rapid City, is consulting engineer.

Idaho

ASHTON, IDAHO—Fall River rural electric co-operative has awarded contract to Hagen & McClintic, Trinidad, Colo., for 90 miles rural transmission lines in Fremont and Madison counties. H. S. Nixon, 219 Grain Exchange building, Omaha, Nebr., is consulting engineer.

SAND POINT, IDAHO—North Idaho rural electrification rehabilitation association, Scott J. Armour, president, has retained John W. Cunningham & Associates, Portland, Oreg., to prepare plans for 30-mile transmission and 55-mile distribution line and hydroelectric plant at Priest River, Oreg. Project will be awarded in three separate contracts.

California

LOS ANGELES—Safety Pin Corp. of America has been incorporated with $100,000 capital to manufacture safety pins and other products. Leo Schaumer, Black building, Los Angeles, is representative.

SAN DIEGO, CALIF.—Consolidated Aircraft Corp. plans to double plant capacity, erecting six buildings, two now under construction.

Oregon

COQUILLE, OREG.—Coos Bay rural electrification association has retained John W. Cunningham, Portland, Oreg., to prepare plans for 99-mile power line between Coquille and Myrtle Point, Oreg.

Washington

LEAVENWORTH, WASH. — City will start immediately on $288,000 sewer system, disposal plant, three miles of 10-inch steel pipe and three miles cast iron pipe. Bids for disposal plant equipment March 26. Parker & Hill, Seattle, engineers.

PASCO, WASH.—Pacific Power & Light Co., R. H. Skill, manager, has 1940 budget of $375,000 for new equipment and line extensions.

SEATTLE—Richfield Oil Co. plans large marine terminal on site on Harbor Island, Seattle. Eleven steel tanks, combined capacity 500,000 barrels, retaining wall, pier, offices, pump and switch house and garage are included. J. J. Downey, Los Angeles, engineer, will place contracts.

Canada

MONCTON, N. B.—Canadian National Railways, W. U. Appleton, general manager, is considering plans for erection of new car shops here.

HALIFAX, N. S.—Brookfield Construction Co. Ltd., 169 Hollis Street, has been awarded general contract for construction of torpedo building here for Dominion Department of Public Works, Ottawa, to cost $68,000.

HAMILTON, ONT.—Hamilton Bridge Co. Ltd., Bay Street North, has been awarded contract for structural steel for construction of machine shop and forge building for Dominion Foundries & Steel, Ltd., Depew Street. Architects, Prack & Prack, 36 James Street West.

MALTON, ONT.—T. Pringle & Son, engineers, 36 Toronto Street, Toronto, is receiving tenders for general contract for construction of two story addition to plant here for Canadian Associated Aircraft Ltd., 1050 Beaver Hall Hill, Montreal, Que.

SUDBURY, ONT. — Sudbury Hydro Commission, Elgin Street, will start work in the spring on erection of $45,000 sub-station on Kathleen street. R. Martindale is manager.

WALLACEBURG, ONT.—John Mathven, 92 King Street West, Chatham, Ont., is preparing plans for addition to plant of Schultz Die Casting Co., Wallace street.

ARVIDA, QUE.—Aluminum Co. of Canada Ltd., 1010 St. Catharine Street West, Montreal, is considering plans for erection of addition to plant here to cost $3,000,000.

ST. HUBERT, QUE.—Canadian Associated Aircraft, Ltd., 1050 Beaver Hall Hill, Montreal, will call for tenders soon for construction of $25,000 plant addition here.

Rx for long lasting PNEUMATIC CHISELS

Bethlehem Omega Tool Steel is made especially for shock-resisting parts that require a combination of hardness and toughness. Although it is primarily an oil-hardening steel, simple sections made of Omega may be very satisfactorily quenched in water.

For pneumatic chisels made of Bethlehem Omega Tool Steel, the recommended procedure is as follows:

Turn the shank from an annealed bar. Heat slowly to approximately 1800 to 1900 deg. F. and forge the cutting edge. Cool slowly. Heat the entire chisel to between 1600 and 1650 deg. F. and quench in oil. Temper to obtain a Scleroscope hardness of about 55, (approximately C43 Rockwell) throughout. Grind the shank to finish dimensions. Heat the thin cutting end of the tool to between 1600 and 1625 deg. F. for about 3 inches and quench the entire chisel in oil. If water is used, the quenching temperature should be about 1500 deg. F. Temper the entire chisel immediately at 450 to 550 deg. F.

In addition to its use in pneumatic chisels, Bethlehem Omega finds wide application in shear blades, calking tools, rivet sets, beading tools, punches, and for all uses where light or heavy loads are subjected to drastic and repeated impact at normal temperatures.

BETHLEHEM

Omega

Shock-resisting
silico-manganese-molybdenum-vanadium
alloy steel

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

TOOL AND DIE SHOPS SAVE TIME
WITH THE
CINCINNATI UNIVERSAL TABLE

. . because it revolves to any angle; rocking top tilts above or below horizontal; vise swivels for rotation of work.

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"ELECTROMET" ferrovanadium is available in all grades used in the open hearth furnace, in the electric furnace, and in the iron foundry, for making every type of vanadium steel and iron. It is produced from domestic vanadium ore obtained in adequate quantities at our own mines in Colorado.

Our metallurgists will gladly tell you more about vanadium and give you practical help in its use. This service is backed by over thirty years' experience in the production and application of ferro-alloys. Why not tap this reservoir of assistance. It is available without obligation.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

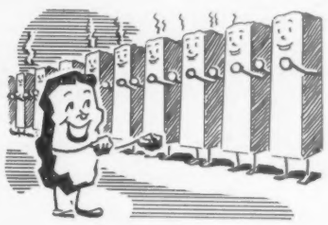
30 East 42nd Street UCC New York, N. Y.

Items of Interest about Vanadium

How Vanadium Improves Steel—Vanadium in steel forms extremely stable, finely dispersed carbides which show little tendency to decompose or segregate on heating. Excess vanadium goes into solid solution in the

ferrite. As a result, vanadium steels have fine, uniform grain; show increased strength, hardness, ductility, and resistance to abrasion and fatigue; and can be easily forged, heat-treated, and machined.

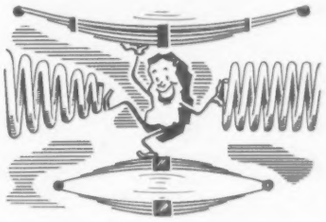
Vanadium Makes Manganese Steels More Uniform—About 0.10 per cent of vanadium in medium-



manganese steels minimizes manganese segregation, and makes these steels more uniform in properties from heat to heat. Microstructure and physical properties are both improved. These steels have high strength and ductility in the as-rolled state and can be welded easily. They are widely used in the railroad and shipbuilding industries where heat-treatment after fabrication is impractical.

Carbon-Vanadium Steels Used for Forgings—A vanadium steel extensively used for both large and small forgings throughout industry contains about 0.50% carbon and 0.18% vanadium. A considerable tonnage of such carbon-vanadium steel has been used by the railroad industry. This steel is also used for automotive engine crankshafts where its freedom from warpage is especially advantageous.

Vanadium In Spring Steels—Three widely used spring steels contain vanadium. They are carbon-



vanadium, chromium-vanadium, and silicon-vanadium steels. The first two are more generally used for flat springs and the last for coil springs. For instance, trucks of the cars of the Twentieth Century Limited have chromium-vanadium steel elliptical springs and silicon-vanadium steel helical springs.

Vanadium Gives Extreme Toughness To Tool Steels—Many tool steels contain vanadium. Vanadium gives these steels the ability to withstand extremely severe pounding and battering, combined with exceptionally good resistance to cracking and warping.

• • •

If you want more information about Vanadium and the many other "Electromet" ferro-alloys and metals and the service that goes with their purchase, write for the booklet, "Electromet Products and Service."

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Reader COMMENTS

Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.

Sight Is Priceless

To the Editor:

"Safety first." This admonition is undoubtedly the nation's most familiar accident prevention slogan. And rightly so, for with such slogans as this, coupled with other educational measures, our steel mills have reduced accidents to an astonishing minimum during the past ten years. But I wonder if there isn't one type of accident that has been entirely overlooked in these campaigns for safety. These accidents are not the spectacular, gory kind; accounts of them never find their way into the records of our industrial commissions and most people regard them as an unescapable part of nature's plan. I am referring to the impairing of one of life's most precious possessions, eyesight.

Oh yes, I know. Steps have been taken to prevent the sudden, instantaneous loss of vision by providing goggles and other protective equipment. But the slow, day-by-day damaging of eyesight by poor illumination, or oftentimes complete lack of illumination, is as common in our steel mills today as steel itself.

How familiar to those acquainted with mill operations is the spectacle of recorders working for hours under inadequate and often makeshift lighting fixtures; of millwrights, electricians, maintenance men of all kinds, making repairs with their only light source an ordinary, small two-cell flashlight, and of storage bins and instrument panels equipped with only the dimmest of lights.

There is absolutely no reason for these most common evils when the remedy, in most cases, is so simple and inexpensive, too, if figured in terms of priceless eyesight. Let us assign someone, possibly a member of the safety department, to check on these sources of poor illumination. Let him have inadequate, outmoded fixtures replaced, dirty reflectors cleaned *often*, correct sizes of bulbs placed in all outlets, but most important of all, proper light supplied wherever necessary. As for the maintenance men, let's give them better light so they can do better, faster work. Innumerable portable lights are being offered for sale today that are just as convenient to use as flashlights and that are ten times more effective.

Remember, by doing these things we will not only be safeguarding the interests of the workers but those of ourselves as well, for a worker with full, unimpaired vision is a better, safer, more valuable worker.

Let us strive to make the slogan "Better light for better sight" just as familiar in our steel mills as "Safety first."

STEEL WORKER

Youngstown, O.

EDITOR'S NOTE—The point is well taken and the remedy has been pointed out in the recent series on industrial illumination by Dean M. Warren and A. R. Finley in STEEL, beginning in the Jan. 22 issue, p. 36 and continuing in subsequent issues.

Needs Good Selling Job

To the Editor:

If manufacturers throughout the country could do as good a job selling their employes and stockholders on the idea of giving their company their moral as well as their financial support, several of the questions which you brought up in your editorial in STEEL, Feb. 5, would be answered.

Just how to bring this about without pulling down on the heads of the manufacturers more of the unjust criticisms that they have been given is a problem that I am not prepared to solve.

WALTER B. VAN WART

Vice President,
Wyatt Metal & Boiler Works,
Dallas, Tex.

"Straight from the Shoulder"

To the Editor:

If your editorials on the duty of manufacturers to put pressure on legislators individually are to work on manufacturers I feel that they will have to be much more direct and even stronger than that which appeared in STEEL, Feb. 5.

I have about come to the place where I feel that many manufacturers lack the power of imagination which is necessary if the inferences of such an editorial are to be completed. Although I regret the fact that I feel this way I might as well tell you the truth, that I think that many manufacturers simply have to be told straight from the shoulder and in terms so unmistakable that each paragraph leaves no room for inference but rather carries its own sting.

PAUL E. HECKEL

Executive assistant,
Cincinnati Bickford Tool Co.,
Cincinnati

EDITORIAL CONTENTS, PAGE 17

Vol. 106, No. 13, March 25, 1940, issue of STEEL, published every Monday at Cleveland, O. Entered as second-class matter at the post-office, Cleveland, O., under act of March 3, 1879. U. S. and Canada; 1 year $4; 2 years, $6; foreign countries, 1 year, $10; Current issues, 25c.

Stepping Up Production with the Warner & Swasey Adjustable Knee Tool

• If you have short bar work or small chucking work on your turret lathe, you, too, can save set-up time, indexing time and production time with this tool. With the improved stub bars and cutter heads, you can combine boring operations with turning and chamfering cuts. To set the tool, take a trial cut, mike it — then adjust with the graduated screw and start turning.

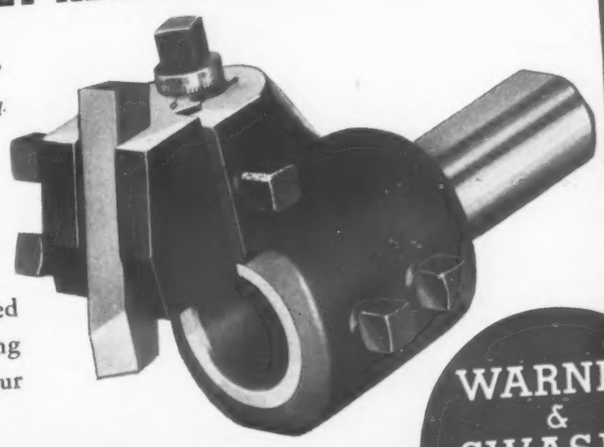
The photograph above shows this *adjustable* Warner & Swasey Knee Tool on a No. 3 Universal Turret Lathe at Cummins Engine Co., Columbus, Ind. The drill held in the center hole of the tool is chamfering the end of a fuel pump plunger barrel while the *adjustable* cutter simultaneously turns a short diameter. Accurate work and profitable time saving!

ORDER THIS NEW WARNER & SWASEY ADJUSTABLE KNEE TOOL

by mail for immediate delivery.

1¼" dia. turning capacity. 1" shank.	2" dia. turning capacity. 1½" shank.	3" dia. turning capacity. 1¾" shank.
Price $35.00	Price $35.00	Price $40.00

F. O. B. Cleveland. Sold on 30 days' approval.
Important: Specify shank size to fit your turret lathe.



Order this tool — use it for 30 days. Blank or finished bushings can be furnished for adapting drills and boring bars to the center hole at slight additional cost. Mail your order to Warner & Swasey, Cleveland, Ohio.

YOU CAN TURN IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TOOLS

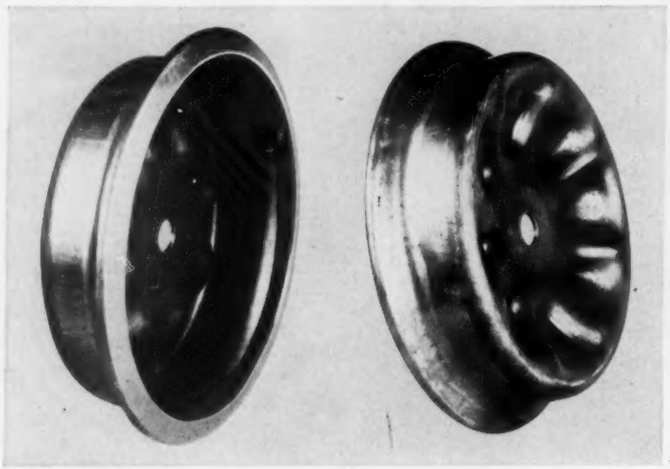
WARNER & SWASEY
Turret Lathes
Cleveland

Here's a tough "draw job", but it's an easy one for

DUCTILOY

National Steel High Tensile Alloy

and these car wheels have unusual resistance to impact, fatigue and abrasion, too!



DUCTILOY

ITS INHERENTLY FINER GRAIN MAKES ALL THE DIFFERENCE

Car wheels made of Ductiloy, formed completely in two operations—1 draw, 2 flange curled.

This is a case—one of many—where the unusual ductility of DUCTILOY has won unqualified approval.

In applications such as these car wheels, where a high tensile steel is desired, *ordinary* high tensile steels often fail because they do not measure up to requirements due to their lack of ductility or cold formability. But DUCTILOY, because of its unusual ductility, can be cold formed readily, in most cases without any change in shop practice.

DUCTILOY has high fatigue and impact resistance, at normal as well as extremely low temperatures—an item of particular importance in parts or equipment that must be operated in all kinds of weather and temperature conditions.

Take advantage of the properties of DUCTILOY. Specify or use it for equipment, parts or products where you want the most for your money in high tensile steel.

Great Lakes Engineers, who have experience covering the use of DUCTILOY in all types of applications, will be glad to consult with you on any of your problems. Ask for a Great Lakes Engineer today—you incur no obligation. Great Lakes Steel Corporation, Detroit, Mich.

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Boston, 1324 Statler Office Building; *Buffalo*, 1000 Walbridge Building; *Chattanooga*, 18 Volunteer Building; *Chicago*, 1026 Builders Building; *Cleveland*, 820 Leader Building; *Dayton*, 846 Third National Bank Building; *Indianapolis*, 1215-17 Circle Tower; *Minneapolis*, 714 Midland Bank Building; *New York*, 405 Lexington Avenue; *Philadelphia*, 407 Liberty Trust Building; *St. Louis*, 3615 Olive Street; *San Francisco*, 824 Sharon Building; *Toledo*, 906 Edison Building. *Montreal*, *Quebec*, Drummond, McCall & Co., Ltd.; *Toronto*, *Ontario*, Peckover's, Limited.

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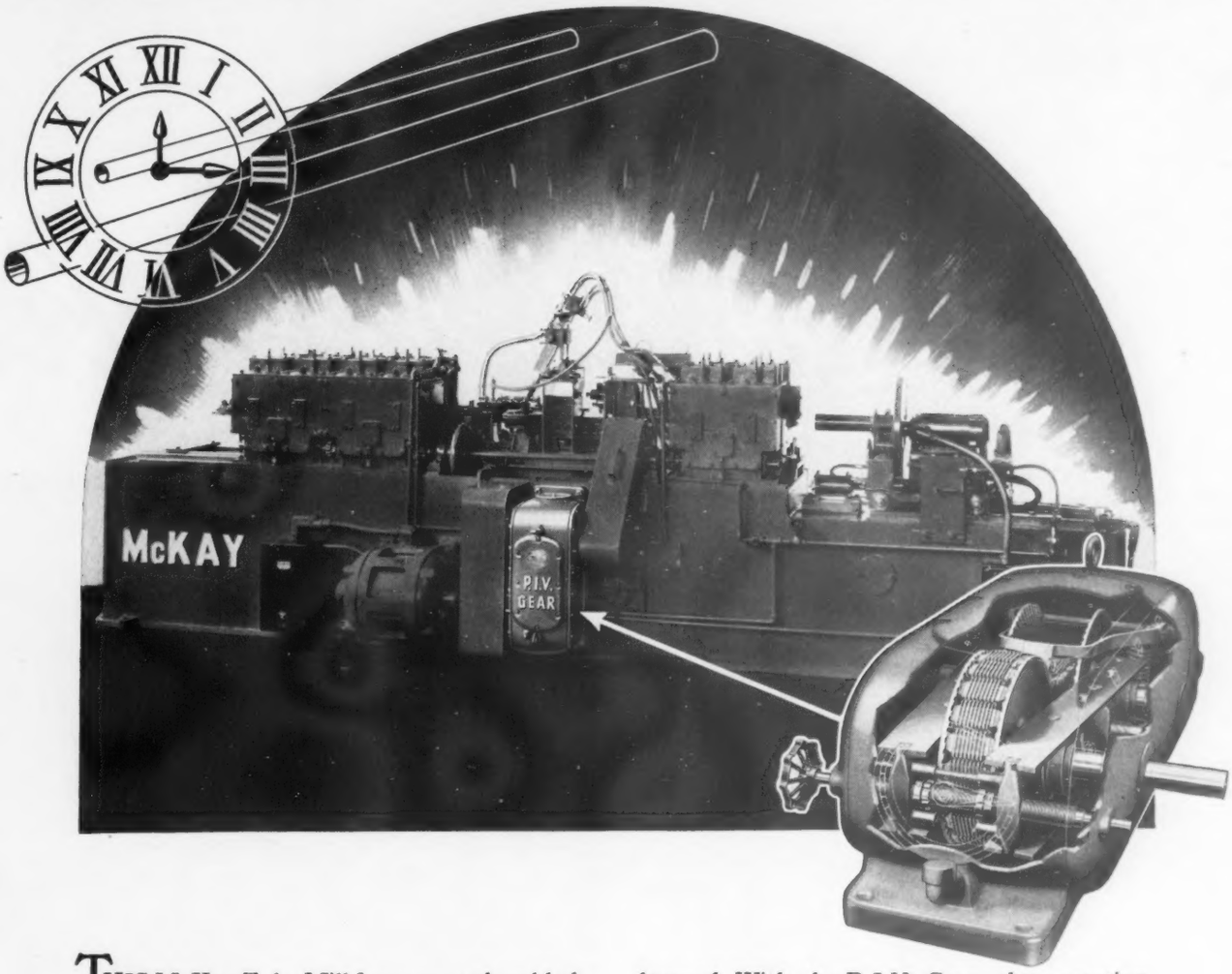
P. I. V. DRIVE MAKES CONTINUOUS TUBE MILL QUICKLY ADAPTABLE To Various Types of Product!



THIS McKay Tube Mill forms smooth welded-steel tubing, from flat strip-steel, at a speed of 40 F.P.M. The strip-steel is formed into tubular shape, welded by oxyacetylene, burr-trimmed, sized, straightened and cut to lengths of 30 inches to 20 feet—all automatically. The machine will produce tubing from $\frac{1}{4}$ to $\frac{5}{8}$ of an inch in diameter. A complete range of machine sizes are available to manufacture tubing, either by acetylene or electro-resistance welding.

The Link-Belt P.I.V. Gear variable speed drive forming part of this machine is an illustration of the trend toward the use of positive, efficient speed control on built-in drives, for which manufacturers are finding an increasing demand. With the P.I.V. Gear, the operating speed of the mill can be altered quickly and easily, whenever desired, to suit the size and composition of the tubing and the welding method.

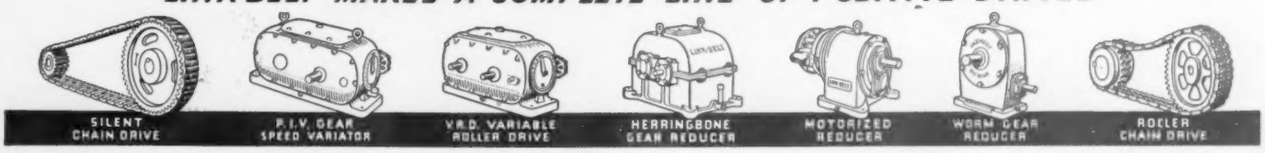
An all-metal, unusually compact unit, available for horizontal or vertical mountings in seven different models, hand or automatic control, the P.I.V. Gear offers you the opportunity of achieving simple, accurate, positive speed control. With it you can build into your machines, the versatility needed to meet today's varying production requirements.

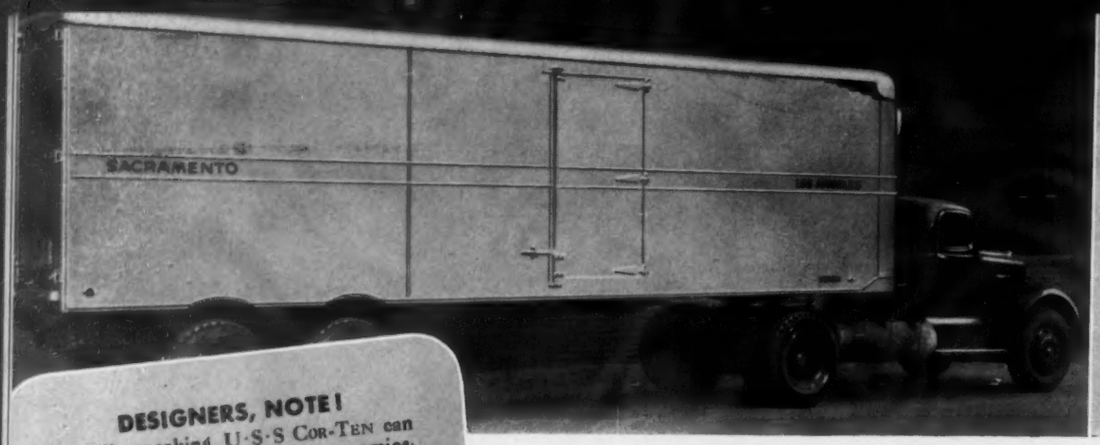
LINK-BELT P.I.V. GEAR SPEED VARIATOR

Send for Book 1574 (1939 Edition). It contains 40 pages of information and engineering data that will be helpful in solving your speed control problems.

Link-Belt Company, Philadelphia, Indianapolis, Chicago, Atlanta, San Francisco, Toronto. Offices in principal cities 8013

LINK-BELT MAKES A COMPLETE LINE OF POSITIVE DRIVES





1900 LBS. LIGHTER — CARRIES 1900 LBS. EXTRA PAYLOAD. To reduce weight of this Fruehauf Freight Trailer, engineers used U·S·S COR-TEN in square tubular posts and trusses to produce an airplane-type trussed body construction 1900 lbs. lighter than other present-day trailers. Compared with older designed or previously designed equipment now on the roads the weight saving is approximately 4000 lbs. Unit is 33' long, 8' wide, 7' high —weighs only 9480 lbs. Can carry almost one ton more payload.

DESIGNERS, NOTE!

Broadly speaking, U·S·S COR-TEN can be applied to effect operating economies, to increase strength or to prolong life in practically every kind of equipment that must be moved, or that must lift, support, or move other materials. U·S·S COR-TEN has been used successfully for—

Transportation Equipment
- Bus Bodies and Frames
- Trackless Trolleys
- Truck and Trailer Frames
- Truck Bodies (dump and freight)
- Tractors

Earth-Moving and Materials-Handling Equipment
- Scrapers
- Graders
- Bulldozers
- Cement Mixers
- Booms—Hoists
- Derricks
- Trench Diggers
- Steam Shovels
- Mine Cars
- Rail Dump Cars
- Ore Cars
- Skips and Cages
- Ventilator Ducts
- Blowers
- Stripping Shovels
- Grab Buckets
- Drag-line Buckets
- Conveyors
- Lumber Carriers
- Stackers

Marine Applications
- Ships
- Boats
- Barges
- Dams and Locks

Roofing and Siding

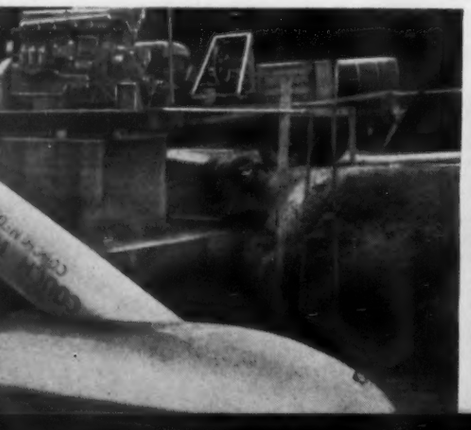
U·S·S COR-TEN is available in all standard forms — plates, shapes, bars; sheet, strip, special cold formed sections and other products. *To get best results with* COR-TEN *it will be helpful to note with your inquiry or order, the purpose and the fabrication procedure contemplated.*

—so they built

BUILT LIGHT AND TOUGH TO DO MORE WORK. Typical of the wide application of U·S·S COR-TEN in road building and earth-moving equipment of all kinds is this White truck, Model 750—one of a fleet of 10 spreading "hot stuff", on California's famous Bakersfield-Grapevine highway. Bodies of these trucks are of 7-yard capacity and are built of U·S·S COR-TEN, by the Standard Auto Body Works, Los Angeles, to give maximum performance and ability to handle the maximum payload with minimum chassis weight.

RECLAIMING FLORIDA'S EVERGLADES WITH COR-TEN EQUIPMENT. Below is one of the four 72" Couch Turbine Pumps, capacity 100,000 gallons per minute, built of COR-TEN and used in the vast water removal and control project which has already reclaimed some 20,000 productive acres from the Everglades of South Dade County, Florida. The eighteen 72" steel culverts 926 lin. ft. in all, fitted with steel swing gates, which shut out the salt water and help keep the fresh water level right for farming, were also built of U·S·S COR-TEN.

CEMENT MIXERS LAST LONGER BUILT WITH U·S·S COR-TEN. U·S·S COR-TEN was used in the mixing drum of this Jaeger-built 5-yard Transit Mixer to add strength and increase the wear resistance of this vital part. COR-TEN was specified by the users of this equipment because of the demonstrated ability of COR-TEN to prolong life of parts subject to the grinding action of sand, stone and cement. COR-TEN's superior resistance to abrasion and extremely high corrosion resistance makes it ideal for equipment such as this.



THEY WANTED LIGHT WEIGHT, CORROSION RESISTANCE AND STRENGTH . . . AT LOW COST

with COR-TEN!

"HOW can I build my product light without increasing its cost and without sacrificing strength or service life? How can I make it last longer without increasing its weight?" U·S·S Cor-Ten answers these basic questions, most economically.

For in U·S·S Cor-Ten we offer you a steel that has a yield point 1½ times that of structural steel—that has resistance to atmospheric corrosion 4 to 6 times that of plain steel—whose resistance to abrasion is ⅓ greater. What is more, Cor-Ten welds satisfactorily, without the need of stress relieving; can be used as received from the mill, without heat treatment. U·S·S Cor-Ten, in addition, is low in cost. When used correctly, not just as a substitute for plain steel, but as an integral factor in new design for weight elimination, Cor-Ten will reduce weight at little or no increase in cost—and without the sacrifice of a single advantage previously enjoyed.

The railroads were the first to prove these facts. With Cor-Ten construction they cut the weight of passenger trains one-third. They built freight cars 9000 lbs. lighter than before—able to carry 4½ tons more payload—that cost not a cent more than the heavy, old-fashioned equipment they replaced.

Using low-cost Cor-Ten construction, the designers of buses, trucks, tractors and trailers converted excess weight into extra strength and greater payload capacity. Builders of materials-handling equipment of all kinds have done the same.

When applied where resistance to corrosion, to abrasion and wear were of prime importance, U·S·S Cor-Ten has in hundreds of widely different installations proved that it will definitely increase life and will lower maintenance costs.

Why not take advantage of the many money-saving advantages that U·S·S Cor-Ten has to offer? Send us your designs and we'll be glad to show you how Cor-Ten can be most economically applied to make your product weigh less, last longer, do more work or sell easier.

COR-TEN SAVES MONEY IN MINE EQUIPMENT. Mine cars like this, built of U·S·S Cor-Ten, weigh 25% less than conventional steel cars, carry 26% more payload . . . U·S·S Cor-Ten elevator buckets, in service in a large coal washing plant handling wet refuse, cost little more and lasted 40% longer than structural steel buckets . . . By replacing a 7½-ton capacity skip weighing 18,500 lbs. with a Cor-Ten 10-ton capacity skip weighing 13,990 lbs., mine was able to materially increase hoisting capacity and save the cost of a new hoist.

U·S·S HIGH TENSILE STEELS

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
Scully Steel Products Company, Chicago, *Warehouse Distributors* · United States Steel Export Company, New York

USS

UNITED STATES STEEL

THE REX MAN REPORTS ON A SWEET-RUNNING COAL CONVEYOR

To you, there's one important feature about this Rex belt conveyor recently installed in a power plant, in my territory. It's a feature every Rex belt conveyor has — a feature that becomes more and more important as, through the years, your Rex belt conveyor continues to give the same reliable service.

That feature is Rex's immunity to long working hours and skimpy maintenance in the face of extremely abrasive and dirty conditions—immunity that is due to the rugged yet precise construction of Rex Belt Idlers.

They are made of steel tubing with tapered Timkens "all around." They have positive, three-way grease seals that stop the wearing action of dust and dirt before it has a chance to start. These same grease seals also prevent grease leakage which is so harmful to belts. *Dust stays out—grease stays in*

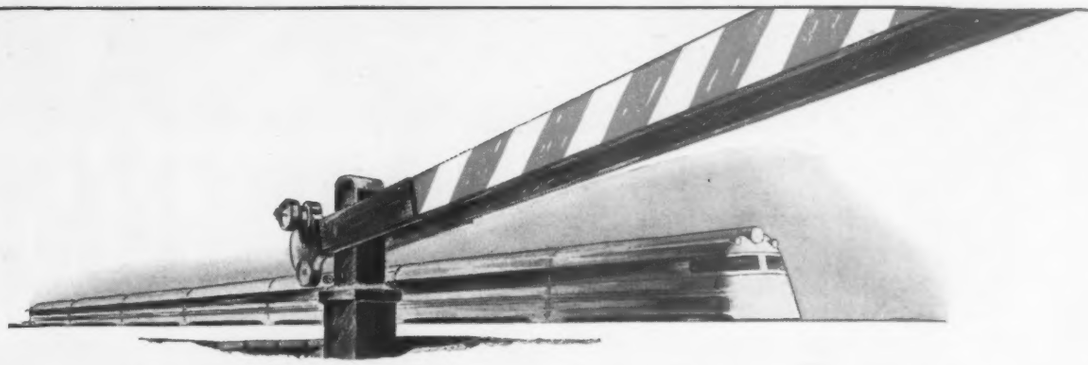
Whether you handle a little or a lot of coal for heat or power, gain the immunity to trouble that Rex idlers and Rex belt conveyors can give you. As a start, send for your copy of the book, "How to Handle It with Rex Coal and Ash Handling Equipment."

Ask for Bulletin 331. Chain Belt Company, 1660 W. Bruce St., Milwaukee, Wisconsin.

REX BELT CONVEYORS

CHAIN BELT COMPANY OF MILWAUKEE

Baldwin-Duckworth Division, Springfield, Massachusetts • Worcester, Massachusetts
Rex Chain Belt and Conveyor Divisions, Milwaukee, Wisconsin • Chicago, Illinois



PUT YOUR ASSEMBLIES ON AN EXPRESS SCHEDULE

...CUTTING 50% OFF ASSEMBLY TIME MEANS QUICKER DELIVERIES!

Don't Take the Local... It Makes Too Many Stops

- ▶ Drill pilot hole.
- ▶ Pick up screw and driver.
- ▶ STOP. You dropped the screw.
- ▶ Pick up another screw.
- ▶ Start driving — very carefully.
- ▶ SLOW. It's going in crooked.
- ▶ Straighten it out — drive.
- ▶ SLOW. The parts are wobbling.
- ▶ STOP. The screw driver slipped.
- ▶ Start again. It's hard going.
- ▶ SLOW. You're turning up burrs.
- ▶ STOP. Can't tighten any further.
- ▶ Get file. Smooth off burrs.
- ▶ Send to refinishing department.

Fasten with Phillips Screws ... and Get There Faster

- ▶ Put screw on end of driver.
- ▶ Point driver like your finger.
- ▶ ZZIP — it's done.

This space represents time saved by Phillips Recessed Head Screw — which eliminates danger of slipping drivers, needs no pilot hole, always drives straight (even with one hand steadying work), sets up tight without split head or burrs.

Two big problems these busy days—customers clamoring for shipments... inexperienced workers on the job. Help solve both problems by adopting the *modern* fastening device. Phillips Recessed Head Screws cut assembly time an average of 50% (according to users' reports) make driving easier... make assemblies stronger, better-looking.

Join the thousands of firms—big and small—who have put their assemblies on a non-stop basis. Get in touch with one of the firms listed below.

PHILLIPS RECESSED HEAD SCREWS...

MACHINE SCREWS SHEET METAL SCREWS WOOD SCREWS STOVE BOLTS

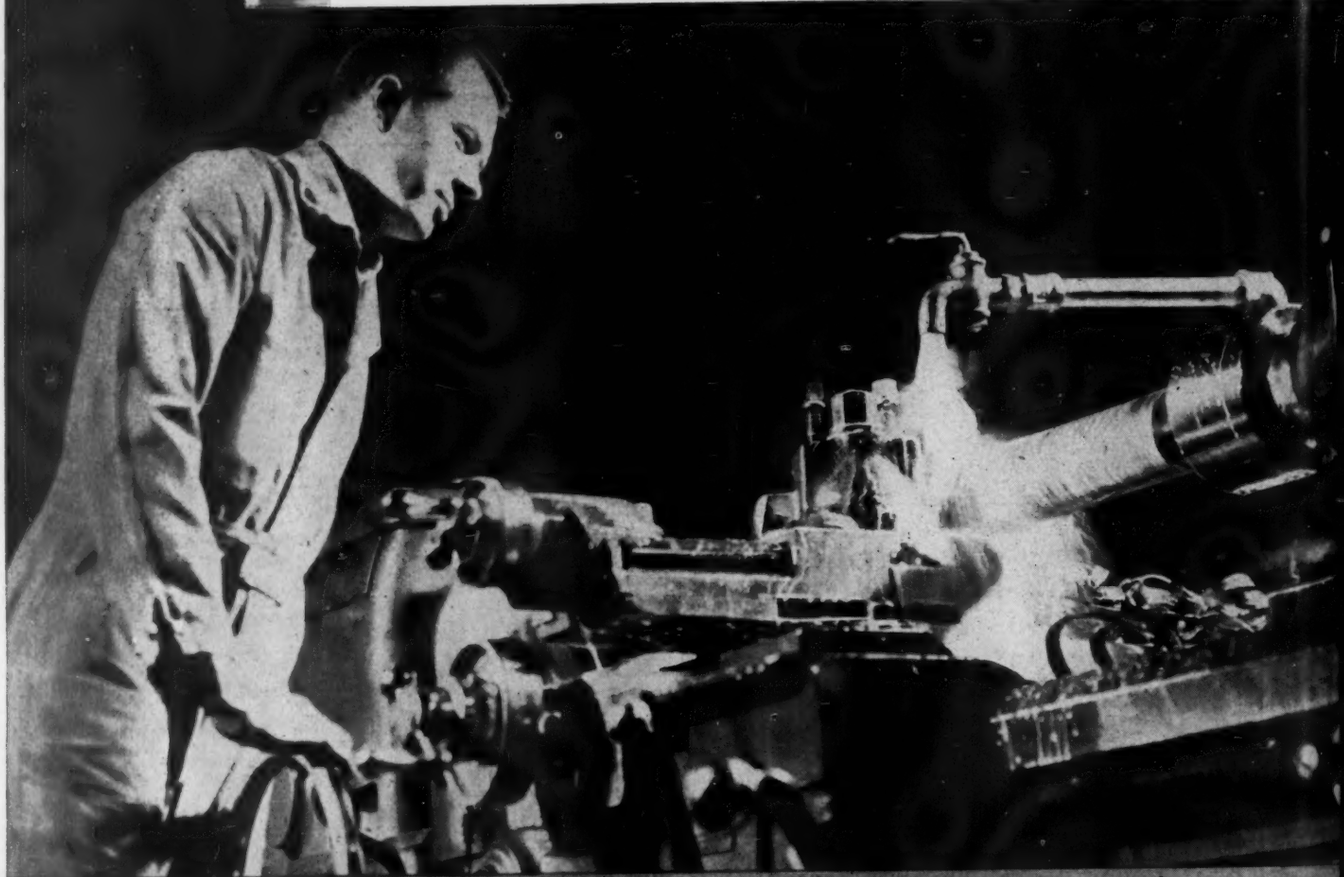
Speed Product Deliveries by Cutting Assembly Time

U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

American Screw Co., Licensor, Providence, R.I.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corporation, New Britain, Conn.
The Lamson & Sessions Co., Cleveland, Ohio
National Screw & Mfg. Co., Cleveland, Ohio
Parker-Kalon Corporation, New York, N.Y.
Pheoll Manufacturing Company, Chicago, Illinois
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N.Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago, Ill.

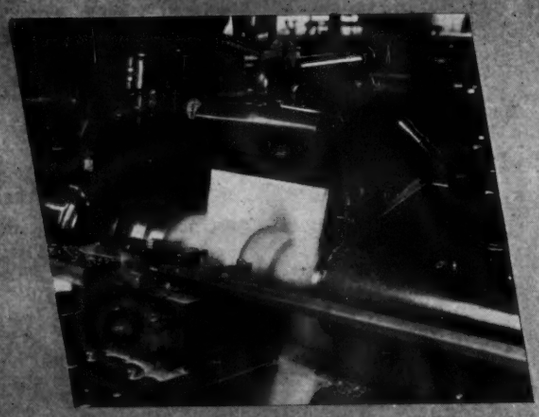
Skilled Mechanics . . . Production Superintendents

MEN WHO KNOW



MONARCH MACHINE TOOL COMPANY . . . Performance Data: Monarch 20" lathe. Model "M." Operation—rough turning. 5" diameter shaft. S A E 1020. SFPM—85. Depth of cut—¾". Feed—.030" per rev. Cutting Lubricant—1 part SUNOCO to 20 parts water.

JONES & LAMSON MACHINE COMPANY . . . Performance Data: #5 Ram type turret lathe. Operation—turning 12" work, holding fixture for Fay Lathe. S A E 1035. Spindle Speed—29 RPM. SFPM—90. Cutting Lubricant—1 part SUNOCO to 20 parts water.



SENECA FALLS MACHINE COMPANY . . . Performance Data: Lo-swing Lathe. Operation—rough turning of airplane cylinder. Brinell 190-200. Removing 35 pounds of metal approx. 6½ min. SFPM—90. Cutting Lubricant—1 part SUNOCO to 20 parts water.

PERFORMANCE BEST...

- specify SUNOCO

PRODUCTION SUPERINTENDENTS . . . SKILLED MECHANICS . . . men who must be guided by performance alone choose SUNOCO Emulsifying Cutting Oil.

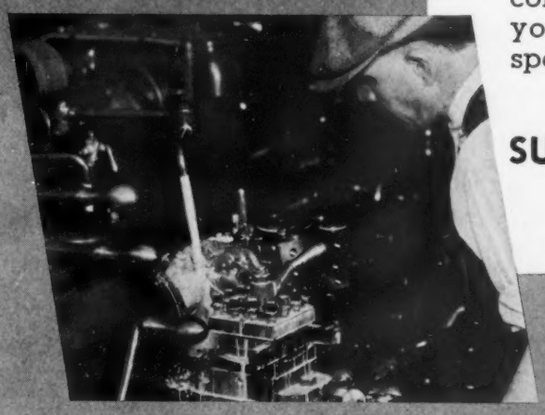
Machine tool production at "rated capacity" is made possible because SUNOCO prevents the tools from chipping or burning . . . permits heavy cuts at high speeds . . . and helps to establish new highs in machine tool efficiency.

PRODUCTION SUPERINTENDENTS know that when it is essential to maintain present-day schedules SUNOCO will aid in reducing rejects due to faulty finishes and inaccurate tolerances.

SKILLED MECHANICS are quick to appreciate that SUNOCO permits chatterfree, clean cutting action at the point of the tool . . . with longer runs between tool regrinding.

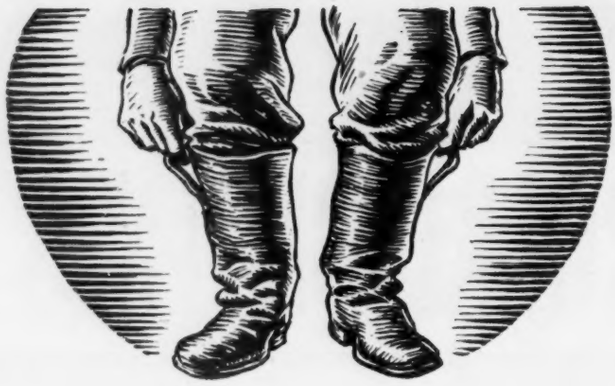
Put SUNOCO to *your* test . . . under *your* working conditions. Let performance facts alone prove to you why "men who know performance best" specify SUNOCO.

SUN OIL COMPANY, Philadelphia, Pa.



WARNER & SWASEY . . . Performance Data: #3 Universal turret lathe. Operation—turning S A E 1315, 1 7/8" hanger pin. 35 1/2 cu. ins. of stock removed per min.; SFPM—510; RPM—1480. Cutting Lubricant—1 part SUNOCO to 20 parts water.

SUNOCO
EMULSIFYING
CUTTING OIL



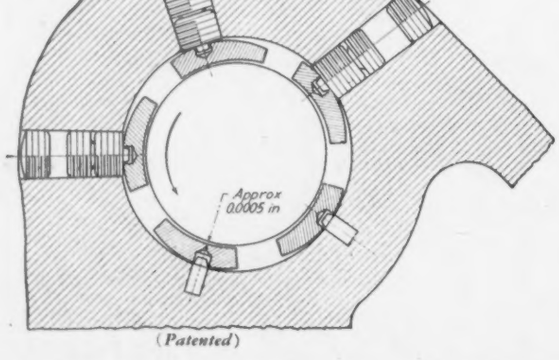
WE LIFT OURSELVES BY OUR OWN BOOTSTRAPS!

IT shouldn't be news when wheels by Carborundum do a good grinding job. But it *is* news when Carborundum-made wheels grind something that helps Carborundum-made wheels do a better grinding job! Sounds like "wheels within wheels". But it's exactly what's happening with the new "Filmatic" spindle bearing developed by Cincinnati Grinders Incorporated. This revolutionary new multiple-shoe spindle bearing, ground and finished with Carborundum-made wheels, is enabling Carborundum-made wheels to give a smoother grind than ever.

Wedge-shaped oil films lock the spindle in its central position with five "fluid vise jaws". The spindle is perfectly free to rotate, but is rigidly and accurately supported at all times. Flutter and waver are eliminated, quality of grinding vastly improved.

We are doubly proud of this story. Proud that wheels by Carborundum are used to help make "Filmatic" bearings. Proud that many Cincinnati Grinding Machines are equipped with Carborundum-made wheels. Doesn't this indicate that wheels by Carborundum ought to be at work on many jobs in *your* plant too?

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE PRODUCTS



(*Patented*)

In the "Filmatic" bearing, developed by Cincinnati Grinders Incorporated, three or more separate self-adjusting shoe members are used to produce independent converging oil films which develop high radial pressures, forcing the spindle into a central position.

In the arrangement shown, the spindle is locked in its central position by five "fluid vise jaws" which still permit perfect freedom of rotation with a coefficient of friction almost identical with that of anti-friction bearings. Because of the high preload, and also because of the ability of the shoes to adjust their wedge angle to accommodate the load, the movement of the spindle under a change in load is only a minute fraction of that which occurs in other types of bearings.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.
REG. U. S. PAT. OFF.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of The Carborundum Company)

The "FRONT SEATS" *go to Products that SELL*

PRODUCTS that have a smart design, a gleaming, eye-appealing finish and LOW COST sell themselves. Dealers like to put merchandise of this type out in front. Does your product have the features that give it a front row seat in dealer displays?

Many manufacturers have discovered that merchandise fabricated from American Quality Cold Rolled Strip Steel has the attractive appearance and low cost that make it move. Frequently parts made from our cold rolled strip steel introduce a saving that is reflected in the price of the entire product.

Our facilities for producing American Quality Cold Rolled Strip Steel have been expanded to meet the increasing demands of industry for this product in its many forms. We have assisted many manufacturers in planning the most economical application of Cold Rolled Strip Steel in their operations and our representatives gladly offer this service to you.

AMERICAN *Quality*
COLD ROLLED
STRIP STEEL

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

UNITED STATES STEEL

HOW THEY GOT A LILY OUT OF BED IN TIME FOR EASTER

1 IF EASTER LILIES BLOOM TOO LATE, florists lose heavily. To the rescue come scientists, who show how blooming can be advanced two weeks with electric light. At Ohio State University, lily at left was kept at 60° F with no added light. Lily at right was given same heat plus four hours extra light daily.

2 SCIENTISTS USED standard 150 watt G-E MAZDA lamps in this test. Similar experiments have employed sodium vapor and mercury arc lamps. General Electric research is constantly finding new ways to improve existing lamps, as well as developing new lamps to meet specific problems.

3 WHAT CAN LIGHT DO FOR YOU? Chicago's Belmont Radio Corporation (above) reported an increase in production and a corresponding decrease in rejects after light-conditioning. Perhaps better lighting can improve your business. Ask your G-E lamp man or your local electric service company.

4 THIS GIANT "ELECTRIC EYE" measures light output of G-E bulbs... one of 480 tests and inspections. Sixty years of G-E research and development have increased lamp efficiency as much as 1000%, reduced prices as much as 85%. Today's 100 watt 15c lamp is almost 50% brighter than the same size you paid $1.10 for in 1921. To get more and more light for your money, year after year, be sure to buy G-E MAZDA lamps.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Year by year, better lamps for every purpose

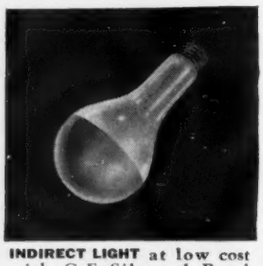
G. E. MAKES 9000 DIFFERENT LAMPS...

How many can help your business?

LIGHT WHERE YOU NEED IT with G-E MAZDA Projector lamp. Lens, filament and reflector in one all-glass unit. The 150 watt size is now only $1.40.

INCREASED DEMAND for more light has sold more larger size bulbs, like this 300 watt inside frost G-E MAZDA lamp. It sells for only 55c.

THIS LOCOMOTIVE HEADLIGHT lamp (250 watts), has dual filament support, stranded lead-in wires to resist vibration. It has a list price of $1.40.



INDIRECT LIGHT at low cost with G-E Silvered Bowl MAZDA lamps. A coating of mirror silver is sealed on bowl. The 150 watt size costs only 55c.